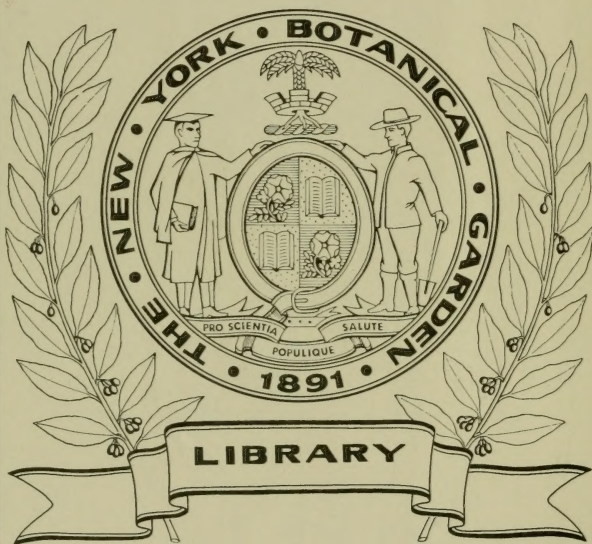


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PROVANCHERIA

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Mémoires de l'Herbier Louis-Marie
Faculté d'Agriculture, Université Laval

FLORA
OF THE
PRAIRIE PROVINCES

A HANDBOOK
TO THE FLORA OF THE PROVINCES OF
MANITOBA, SASKATCHEWAN AND ALBERTA

by

BERNARD BOIVIN

Herbier Louis-Marie, Université Laval
and Department of Agriculture, Ottawa

Part I

Pteroids, Ferns, Conifers and
Woody Dicotyledons

(continued)

1. HYPERICUM L.

ST. JOHN'S-WORT

Herbs (ours) with transparent-dotted leaves. Flowers yellow, pentamerous.

- a. Leaves lanceolate 2. H. majus
 aa. Leaves broader, oblong to suborbicular.

- b. Leaves, sepals and petals black-dotted
 along the edge 1. H. formosum
 bb. Not black-dotted 3. H. virginicum

1. H. formosum HBK. var. Nortoniae (M.E. Jones) C.L. Hitchc. (var. Scouleri AA.) -- Leaves and petals, and to a lesser extent the sepals, abundantly black-dotted along the edge. Perennial herb, about 1 dm high, with ovate to suborbicular leaves. Later half of summer. Wet places in the mountains.--swAlta-BC, wUS.

The more western var. Scouleri (Hooker) Coulter is taller, 2-5-(8) dm high, and has narrower leaves.

2. H. majus (Gray) Britton (H. canadense AA.) -- Petals yellow, small, somewhat shorter than the sepals. Stiffly erect herb 1-4 dm high. Leaves more or less lanceolate, not black punctate. Sepals elongating up to 5-7 mm in fruit. Summer. Shores.--NS-BC, US, (Eur).

The only Alberta collection studied was from Grouard.

The only know collection of H. canadense L. for Manitoba was J.G. Feller, Whitemouth (WIN; DAO, photo). It has been revised to H. majus. Similarly a report of H. anagalloides C. & S. by Macoun 1883 was based on Macoun, Cypress Hills, 1880 (CAN; DAO, photo), a collection later revised and correctly reported by Breitung 1954 as H. majus. Again, the range of H. canadense was extended to B.C. by Macoun 1895. But both specimens cited (CAN; DAO, photo) have since been revised to H. majus.

3. H. virginicum L. var. Fraseri (Spach) Fern. (Triadenum Fraseri (Spach) Gleason) Fruit larger, about 1 cm long. Stem 3-6 dm high. Leaves ovate to oblong, shallowly cordate at base, glaucous below. Petals pink to mauve, slightly longer than the sepals. Mid summer. Shores, often boggy shores. Amisk Lake and eastward.--(L)-NF-SPM, NS-ecS, US.

In the more southern and eastern var. virginicum the sepals are 5-7 mm long in fruit and acute at tip while the styles are 2-3 mm long. On the other hand our var. Fraseri has shorter sepals, 3-5 mm long, and rather obtuse or rounded at tip, while the style is shorter, mostly a bit less than 1 mm long.

Order 25. ERICALES

Anthers acuminate at tip or prolonged into a horn, opening by apical pores. Otherwise a rather variable group and transitional between the groups with free petals and superior ovary and the groups with fused petals and inferior

ovary. Leaves simple, often entire and persistent.

a. Stamens free.

b. Ovary superior.

c. Petals free. Herbs.

d. Green plants 41. Pyrolaceae

dd. Parasitic plants devoid of green

colour 42. Monotropaceae

cc. Petals fused (except Ledum). Shrubs.

..... 39. Ericaceae

bb. Ovary inferior 40. Vacciniaceae

aa. Stamens adnate to the corolla 43. Diapensiaceae

39. ERICACEAE

Shrubs, mostly with persistent and rather thickish or leathery leaves. Flowers mostly with fused sepals, and also mostly with fused petals. Ovary superior.

a. Leaves opposite.

b. Leaves small, less than 1 cm long.

c. Flowers in a terminal corymbose cluster.

..... 4. Loiseleuria

cc. Flowers axillary 7. Cassiope

bb. Leaves larger 5. Kalmia

aa. Leaves alternate.

d. Flowers solitary in the leaf axils.

..... 11. Gaultheria

dd. Flowers more or less aggregated in usually terminal inflorescences.

e. Inflorescence a terminal cluster or corymb overtopping the foliage.

f. Leaves linear, 2 mm wide or less.

g. Leaves green below 6. Phyllodoce

gg. Covered below with a dense rusty felt 1. Ledum

ff. Broader leaves.

h. Inflorescence not punctate, but

glabrous 8. Andromeda

hh. Inflorescence glandular-punctate to puberulent or pilose.

i. Inflorescence densely glandular-punctate, but not pubescent

..... 2. Rhododendron

ii. Densely glandular-puberulent

or pilose 1. Ledum

ee. Inflorescence lateral, or leafy, or more or less overtopped by the leaves.

j. Flowers in axillary clusters at leafless nodes on old wood ... 2. Rhododendron

jj. Inflorescence more or less terminal.

- k. Leaves deeply cordate at base 10. Epigaea
 kk. Rounded to cuneate at base.
 1. Leaves scaly-punctate below 9. Chamaedaphne
 ll. Not punctate.
 m. Leaves pubescent on both faces with glandular hairs 3. Menziesia
 mm. Glabrous on both faces 12. Arctostaphylos

1. LEDUM L.

LABRADOR TEA

Petals free. Flowers white, in terminal umbels.

- a. Leaves felty-tomentose below 1. L. palustre
 aa. Glaucous and glandular-dotted below... 2. L. glandulosum

1. L. palustre L. var. latifolium (Jacq.) Mx. (L. groenlandicum Oeder) -- Labrador-Tea (Thé du Labrador, Bois de savane) -- Leaves strongly revolute and covered below with a very thick rust-coloured felt, but green and glabrous above. Leaves lanceolate, mostly 5-10 mm wide. Flowers white and making the shrub very conspicuous in the bogs at flowering time. Late spring and early summer.--G, K-Aka, L-SPM, NS-BC, US -- Var. decumbens Aiton (L. decumbens (Aiton) Lodd.) -- Generally smaller and lower, the leaves linear, 1-2 mm wide, sparsely glandular above. Spring. Arctic and alpine tundras.--G-Aka, L, Q-n0-nMan-nBC, (Eur).

The bog phase grades northward into the tundra phase.

The report of var. decumbens by Anderson 1949 and Szczawinski 1962 for Newfoundland is probably to be interpreted in the sense of Labrador, a territory which we have listed separately here in accordance with traditional botanical practice, but which is also administratively part of Newfoundland.

2. L. glandulosum Nutt. var. glandulosum -- Trapper's Tea -- Leaves densely dotted with yellow glands below and also usually very white below with a dense and minute pubescence. Twigs white-puberulent. Leaves nearly flat, ovate to lanceolate, deep green and glabrous above. Inflorescence finely puberulent. Early summer. Moist woods.--swAlta-BC, US.

In the western U.S.A. occurs a var. columbianum (Piper) C.L. Hitchc. with strongly revolute and narrower leaves, etc. It was also reported by Szczawinski 1962 from Vancouver, but this report is held to be questionable as the original 1901 collection has never been confirmed, is out of range by more than 150 miles, and might have been a cultivated plant.

2. RHODODENDRON L.

ROSE BAY

Petals unevenly fused, two of them being fused at least half their length, the other 3 much less united, thus the flower is slightly asymmetrical.

- a. Flowers borne on the old wood, below the foliage 1. R. albiflorum
 aa. Inflorescence terminal 2. R. lapponicum

1. R. albiflorum Hooker -- White Rhododendron -- Flowers borne on the old wood in clusters of 1-3 in the axils of last year's leaves. Herbage glandular-hirsute. Leaves lanceolate, entire, deciduous. Flower white to creamy, fairly large. Before mid-summer. Mountain forests.--swAlta-BC, nwUS.

2. R. lapponicum Wahl. -- Except the purple corolla, densely covered throughout with crowded glandular dots, some clear yellow, some reddish brown. Low prostrate shrub with persistent leaves, the blade oblong-lanceolate, revolute, soon drooping. Spring. Arctic and alpine tundra.--G-Aka, L-NF, Q-nMan, swAlta-BC, US, Eur.

3. MENZIESIA Sm.

Petals fused into an urceolate corolla. Fruit a septicidal capsule. Shrubs with deciduous leaves.

1. M. ferruginea Sm. var. glabella (Gray) Peck (M. glabella Gray) -- Fool's Huckleberry -- Flowers in an umbel at the ends of last year's shoot. Foliage mostly carried on paired branches borne just below the inflorescences. Leaves obovate to oblanceolate, serrulate. Flowers 4-merous, creamy to pinkish. Early summer. Moist mountain forests.--wAlta-BC, (nwUS).

Var. glabella has leaves obtuse or rounded at summit, densely puberulent below, the pubescence obscurely mixed with some sessile glands. The upper face of the leaves has pubescence similar to var. ferruginea, but mixed with a less abundant and very fine puberulence. Calyx and ovary finely puberulent and glandular-ciliate.

The more costal var. ferruginea tends to leaves more acute at summit, but differs mainly on minor rearrangements of kinds of pubescence. Leaves not puberulent and sometimes glabrous, but commonly bearing a scanty and coarse pubescence of long hairs mixed with glandular hairs and sessile glands; also glandular-ciliate. Calyx and ovary glandular and glandular-ciliate, but not puberulent.

A Laggan collection (CAN; DAO, photo) dated 1913 fits var. ferruginea but it has never been confirmed and it is so far out of range that we are inclined to suspect a mixture of labels in this case. Our experience of herbaria

would indicate that the probability of a mixed label is about one in 1000 to 10,000 specimens. It varies greatly from herbarium to herbarium and also with the period in time in each herbarium. In most cases label mixtures are so obvious as to constitute no serious source of error.

4. LOISELEURIA Desv.

Flower similar to the preceding, campanulate with fused petals. Capsule septicidal. Leaves opposite. Scales of the flower buds enlarging, becoming green and persistent.

1. L. procumbens (L.) Desv. -- Mayflower, White Flower -- A prostrate shrub with small opposite leaves that are rather similar to those of Empetrum. Leaves tomentose dorsally and on the ventral face of the petiole. Peduncles and calyces glabrous and deep red. Corolla pinkish, small. First half of summer. Drier and rocky tundras.--G-(F)-K-Aka, L-SPM, NS, Q, nMan-nS, wBC, US, Eur.

The various reports for Alberta, Campbell 1900, Hultén 1948 and, doubtfully, Boivin 1966 are likely all unjustified, even if the possibility of its occurrence in the northern parts of the province is not exactly improbable. Campbell's report is presumably based on a misidentification; see comment under Coronopus didymus, part II. Boivin's report is based on Hultén's, which reads "Alberta (54°N.)" and which in turn is likely to be a misreading of Hooker 1834 repeated by Macoun 1884 of 'Mount Edgecombe, lat. 54°'. The said mountain is a feature of the Alaska Panhandle in the vicinity of 54°N, not of the Rockies of Alberta.

5. KALMIA L.

AMERICAN LAUREL

Corolla rotate with 10 depressions in which the anthers are held under pressure from the tensed filaments.

1. K. polifolia Wang. var. polifolia (K. polifolia sphalm.) -- Gold Withy, Bog Laurel -- Internodes flattened in alternating planes. Leaves opposite, persistent, lanceolate to linear, 2-3 cm long, strongly revolute, almost white and seemingly glaucous below, but actually densely covered with minute stellate hairs, the midrib prominent and usually beset with purple, clavate hairs. Flower pinkish red. Late spring and early summer. Common in bogs.--K-Mack-(Y)-Aka, L-SPM, NS-S, (BC), US -- Var. microphylla (Hooker) Rehder -- Lower and with shorter and broader leaves. Mostly about 1 dm high. Leaves around 1 cm long and more or less oblong, only slightly revolute, the midrib glabrous. Alpine meadows and subalpine forests.--K-Y-(Aka), Alta-BC, wUS.

West of us the distinction of our two varieties becomes meaningless as most of the B.C. material is intermediate, the leaves being usually long and narrow but glandless on the midrib.

6. PHYLLODOCE Sal.

Foliage rather similar to that of Picea, linear, persistent, coriaceous and likewise borne on raised leaf bases. Flower urceolate and the capsule septicidal. Low shrubs.

- a. Flowers yellowish 3. P. glanduliflora
 aa. Pink to purple.
 b. Calyx glabrous 2. P. empetriformis
 bb. Densely glandular 1. P. caerulea

1. P. caerulea (L.) Bab. -- Mountain Heath -- Leaves closely glandular-serrulate. Peduncles, calyx and capsule densely glandular. Corolla glabrous, purple. Summer. Late snow patches.--G-K-(Mack, Aka), L-NF, NS, Q, nMan, neUS, Eur.

2. P. empetriformis (Sm.) D. Don -- Heather, Pink Mountain-Heather -- Calyx glabrous; plant otherwise densely glandular as in P. caerulea. Corolla glabrous, pink. Early to mid summer. Marshy meadows around timberline.--(Mack)-Y-(Aka), swAlta-BC, US.

X. P. intermedia (Hooker) Rydb. -- Hybrid with P. glandulifera. Calyx somewhat glandular. Corolla pinkish, glabrous to slightly glandular. Local.--swAlta-BC, (US).

3. P. glanduliflora (Hooker) Cov. -- Yellow Mountain-Heather -- Corolla, calyx, peduncles and capsules densely glandular. Leaves serrulate, glandular-ciliate. Corolla yellowish. First half of summer. High in the mountains, mostly around late snow patches.--Mack-Aka, swAlta-BC, nwUS.

7. CASSIOPE D. Don

Dwarf shrubs with small imbricated leaves and solitary axillary flowers.

- a. Leaves with a deep and obvious dorsal groove
 1. C. tetragona
 aa. Leaves level on the back 2. C. Mertensiana

1. C. tetragona (L.) D. Don var. saximontana (Small) C.L. Hitchc. -- White Heather, Moss-Plant -- Leaves thick, short, densely imbricate into squarish branchlets. Leaves 3-5 mm long, densely short ciliate. Flower white, on a finely glandular peduncle. First half of summer. Rocky alpine and subalpine slopes.--Y, swAlta-seBC, (nwUS).

The typical phase is more northern, has longer pedicels, mostly over 1 cm long, and tends to slightly larger flowers, 5-7 mm long.

2. C. Mertensiana (Bong.) G. Don var. Mertensiana -- Quite similar to the preceeding, but the leaves not grooved on the back and not ciliate. Peduncles densely puberulent. Mid summer. Open forest and alpine prairies around timber-

line.--Aka, swAlta-BC, US.

The more southern var. gracilis (Piper) C.L. Hitchc. has ciliate leaves and glabrous peduncles.

8. ANDROMEDA L.

ANDROMEDA

Flower and fruit as in Menziesia, Chamaedaphne, etc., but the leaves persistent and the inflorescence a terminal bracteolate umbel.

1. A. Polifolia L. var. Polifolia -- Crystal-Berry, Gold-Withy -- Leaves much as in Kalmia polifolia, but alternate. About 1 dm high and glabrous throughout. Leaves 1-3 cm long, narrowly elliptic to narrowly lanceolate, strongly white-glaucous below. Flower pinkish. Late spring to early summer. Bogs.--G, K-Mack-(Y-Aka), Q-BC, Eur -- Var. glaucophylla (Link) DC. (A. glaucophylla Link) -- Plant generally larger, the leaves very finely and very densely white tomentose below, lanceolate to linear.--(G)-F-K, L-(NF)-SPM, (NS-NB)-Q-S, US.

9. CHAMAEDAPHNE Moench

LEATHER-LEAF

Sepals nearly free, subtended by 2 bractlets. Corolla and fruit as in the preceeding. Flowers solitary in the axils of the upper leaves, forming a leafy terminal raceme.

1. C. calyculata (L.) Moench (var. angustifolia (Aiton) Rehder, var. latifolia (Aiton) Fern.) -- Gold-Withy, Leather-Leaf (Faux-bleuets) -- Leaves densely scaly-punctate in clear-white, yellow and red brown, more so on the lower face. Twigs densely puberulent. Leaves elliptic to lanceolate, serrulate, those of the inflorescence gradually smaller. Flowers white, drooping. Early summer. Common in muskegs--K-Aka, L-SPM, NS-BC, US, Eur.

10. EPIGAEA L.

Calyx similar to the preceeding, with 2 subtending bracts and 5 practically free sepals. Flower with an elongate tube and flaring throat.

1. E. repens L. var. glabrifolia Fern. -- Mayflower, Trailing Arbutus (Fleur de mai) -- Leaves deeply cordate at base, ovate to oblong. Creeping and barely woody, coarsely glandular-hispid throughout, especially on the branchlets. Flowers white, in a few-flowered terminal raceme. Late spring. Coniferous woods.--(L)-NF-SPM, (NS-NB)-Q-(O)-sMan, US.

In our variety the leaves are glabrous below at maturity, except sometimes on the midnerve, while in the more southern var. repens they are variously pubescent (usually pilose) below at maturity.

11. GAULTHERIA L.

WINTERGREEN

Calyx becoming thick and fleshy, growing around the capsule into a pseudo-berry. Flower otherwise similar to that of Andromeda, etc. Low shrubs, not very woody.

a. Leaves small, entire 3. G. hispida
aa. Larger, serrulate.

b. Leaves cuneate at base 1. G. procumbens

bb. Leaves rounded at base 2. G. humifusa

1. G. procumbens L. -- Ivyberry, Checkerberry (Thé des bois, The rouge) -- Only 1 dm high or less, with the 3-5 leaves clustered near the top of the erect stem. Long stoloniferous. Leaves narrowly obovate, 1.5-4.0 cm long. Flowers white, few, nodding. Berry bright red. All summer. Sandy coniferous woods.--NF-SPM, NS-seMan, eUS.

2. G. humifusa (Graham) Rydb. -- Mountain-Teaberry -- Leaves serrulate, the teeth setiferous on the younger leaves. Stoloniferous and very low. Leaves about 1 cm long, oval to suborbicular, the margin finely penciled in white. Flower pinkish. Fruit reddish. Mid summer. Wet mountain slopes.--swAlta-BC, wUS.

3. G. hispidula (L.) Muhl. (Chiogenes hispidula (L.) T. & G.) -- Teaberry (Petit thé, Oeufs-de-perdrix) -- Flowers small, only 2 mm long, and 4-merous. Extensively creeping. Leaves numerous, broadly ovate, subsessile, (0.3)-0.5-(1.0) cm long and ciliate with a few coarse hairs. Berry white. Spring. Forming tangled mats in mossy woods.--K, L-SPM, NS-BC, US.

12. ARCTOSTAPHYLOS Adanson

Fruit a berry developing in the usual manner from the ovary.

a. Leaves serrulate 1. A. alpina

aa. Leaves entire 2. A. Uva-Ursi

1. A. alpina (L.) Sprengel var. alpina -- Foxberry, Poison-Berry (Herbe à caribou, Raisin d'ours) -- Leaves thin, impressed above and rugose below. Stem prostrate and mat forming. Leaves more or less marcescent, obovate to spatulate, long cuneate, finely ciliate towards the base and along the petiole. Flower yellowish. Fruit red to blackish. Early spring. Rocky and gravelly arctic or alpine tundras. --G-Aka, L-SPM, Q-(nO)-nMan, swAlta-nBC, (neUS), Eur -- Var. rubra (Rehder & Wilson) Bean (A. rubra (Rehder & Wilson) Fern.; Arctous erythrocarpa Small) -- Leaves very rugose, little or not at all marcescent, not ciliate or barely so. Berry remaining scarlet at maturity.--(F)-K-Aka, (NF), Q-(O)-nMan-nAlta-BC, (Eur).

2. A. Uva-Ursi (L.) Sprengel (var. adenotricha Fern. & Macbr., var. coactilis Fern. & Macbr.) -- Kinnikinick, Bearberry (Raisin d'ours, Sac à commis) -- Leaves finely tomentose-ciliate, also more or less tomentose along the mid-nerve. Widely spreading, carpeting shrub. Leaves thick, spatulate, entire, persistent. Flowers white to pinkish. Berries dull red. Late spring and early summer. Forming carpets over dry or sandy ground.--(G), K-Aka, L-SPM, NS-BG, US, Eur.

Var. adenotricha and var. coactilis are less common phenotypes, rather than geographically restricted varieties.

40. VACCINIACEAE (HUCKLEBERRY FAMILY)

Like the Ericaceae, but the ovary inferior and the fruit a juicy berry. Petals and sepals fused.

1. VACCINIUM L.

BLUEBERRY

Fruit a berry with numerous small seeds.

- a. Peduncles much longer than the leaves ..
..... 8. V. Oxycoccus
- aa. Peduncles much shorter.
 - b. Leaves persistent, retuse at tip .
..... 7. V. Vitis-idaea
 - bb. Deciduous and not retuse.
 - c. Flowers in terminal bracteolate racemes 6. V. angustifolium
 - cc. Flowers solitary in the axils of normal leaves, or 1-3 in a small leafless terminal glomerule.
 - d. Leaves entire 1. V. uliginosum
 - dd. Serrulate.
 - e. Twigs round, puberulent ..
..... 2. V. caespitosum
 - ee. Twigs narrowly winged-decurrent, usually glabrous.
 - f. Berries red; peduncles up to 3 mm long 3. V. scoparium
 - ff. Berries blue to black; peduncles usually longer, up to 1 cm.
 - g. Low, the leaves mostly 1-2 cm long ... 4. V. Myrtillus
 - gg. Taller, the leaves mostly 3-4 cm long ..
..... 5. V. membranaceum

1. V. uliginosum L. var. uliginosum (var. alpinum Big.) -- Ground-Hurts, Bog Bilberry (Bleuet trainard, Bleuet magané) -- Leaves entire, obovate. Stem trailing, with erect branches 1-5 dm high. Leaves obovate, around 1 cm

long, thickish, paler below. Flowers white to pinkish, 1-3 in a small leafless glomerule terminating last year's shoot. Fruit blue. Late spring to mid summer. Wetter arctic and alpine habitats.--(G)-F-Y-(Aka), L-(NF-SPM), NS-(PEI)-NB-Man-(S-Alta)-BC, US, (Eur).

The more western var. occidentale (Gray) Hara has narrower leaves, 2-3 times as long as large. Many other segregates have been proposed, including a smaller V. microphyllum (Lange) Löve, but all these phenotypes are sympatric and grade into one another.

2. V. caespitosum Mx. -- English Blueberry, Dwarf Bilberry (Blueets, Blueets maganés) -- Much like the preceding and growing in similar habitats. Leaves 1-3 cm long, typically narrowly obovate, varying from narrowly obovate to narrowly lanceolate, serrulate, thin. Late spring. Cold woods.--K-Aka, L-NF, NS, NB-O-(Man)-S-BC, US, (Eur).

3. V. scoparium Leiberg -- Grouseberry, Whortleberry -- Low shrub, broom-like, with numerous rather stiffly erect branches. Mostly about 1 dm high. Leaves small, less than 1 cm long at flowering, sometimes up to 1.5 cm later. Peduncles 2-3 mm long. Fruit red, drying blue. Late spring. Dry coniferous forest at higher altitudes.--swAlta-BC, (US).

4. V. Myrtilus L. -- Dwarf Bilberry (Myrtille) -- Rather intermediate between the previous and the next. About 2 dm high and the branches widely divergent. Leaves broadly ovate to elliptic, subcordate to broadly rounded at base. Peduncle 3-6 mm long. Berry red, turning blue or black. Early summer. Common and abundant in mountain coniferous woods.--G, swAlta-BC, (wUS, Eur).

The only known Greenland collection is from Alangorsuak (CAN; DAO, photo) and represents probably an introduction rather than a range disjunction. Unless it be a case of mixed labels.

5. V. membranaceum Douglas -- Bilberry, Mountain Huckleberry -- Tallest of the solitary-flowered species. Erect, 2-10 dm high. Leaves 2-5 cm long, elliptic to broadly lanceolate. Peduncles 5-10 mm long. Berries dark blue to black. Early summer. Light mountain woods,--swMack,--(CO), swAlta-seBC, (US).

6. V. angustifolium Aiton var. angustifolium (var. laevifolium House; V. boreale Hall & Aalders; V. Lamarckii Camp; V. pennsylvanicum Lam., var. angustifolium (Aiton) Gray) -- Blueberry (Bleuets, Bleuets de savane) -- Flowers in short leafless racemes borne at the end of last year's shoot. Commonly 3-4 dm high. Twigs and leaves glabrous. Leaves 1.0-3.5 cm long, mostly lanceolate, finely serrate. Berry delicious, blue with a heavy bloom. Late spring. Bogs and acid rocks or soils.--K, L-NF-(SPM), NS-(PEI-NB)-Q-O-(seMan, US) -- F. nigrum (Wood) Boivin (V. Brittonii Porter; V. nigrum Britton) -- Fruit black, without bloom.--

(NF, NS-NB)-Q-Q-(seMan, US) -- Var. myrtilloides (Mx.) House (V. canadense Kalm; V. myrtilloides Mx.; Cyanococcus canadensis (Kalm) Rydb.) -- Twigs and leaves pubescent, the latter usually entire. (Flowering some two weeks later?). Shadier and wetter places.--(Mack, L-NF), NS-(PEI)-NB-BC, US.

Usually subdivided into two or more species. Although we have had much field experience with this entity, we have never been able to detect more than one species in the field and var. myrtilloides has always remained an arbitrary distinction best made in the herbarium with a good handlens or binocular. Intermediates occur between our two varieties; some show an intermediate morphology, others present unusual combinations of the diagnostic characters. The various kinds of intermediates have been decorated with binomials. Diploid and tetraploid forms occur and have been named respectively V. boreale and V. Lamarokii.

7. V. Vitis-idaea L. var. minus Lodd. (Vitis-idaea punctata Moench) -- Partridge-Berry, Redberries (Graines rouges, Pommes de terre) -- Leaves sparsely glandular-pubescent below with small brown hairs. Low shrub with thick, persistent leaves, some of which are retuse at tip. Flowers in bracteolate terminal racemes. Fruit red. Late spring to early summer. Bogs and acid woods.--(G)-F-Aka, L-SPM, NS-BC, US, (Eur).

In the Old World var. Vitis-idaea the leaves average larger, not always a clear cut distinction.

8. V. Oxycoccus L. var. Oxycoccus -- (var. ovalifolium Mx.; Oxycoccus ovalifolius (Mx.) Forsild; O. palustris Pers.; O. quadripetalus Gilibert) -- Cranberry, Marshberry (Atocas, Grisettes) -- Small shrub, little woody, with thin wiry stems half buried in Sphagnum. Leaves 5-8 mm long, persistent, mostly elliptical. Flowers red or pink in clusters of 1-4 at the end of branches or stems. Peduncle 2.0-3.5 cm long, finely puberulent. Corolla deeply lobed. Berry 8-10 mm across, at first punctate, turning red, then black. Early summer. Sphagnum bogs.--K-Mack, L-NF, NS-PEI-(NB)-Q-BC, US, Eur -- Var. microphyllum (Lange) Rouss. & Raym. (var. ovalifolium AA.; V. microcarpum (Turcz.) Hooker; V. Oxycoccus AA.; Oxycoccus microcarpus Turcz.; O. ovalifolius AA.) -- Generally smaller. Leaves (2)-3-4-(5) mm long, mostly ovate. Peduncles 1-2 cm long, often glabrous or nearly so. Fruit somewhat smaller.--(G), K-Aka, L-SPM, NS-PEI, Q-BC, US, Eur.

We have examined the type of Michaux' var. ovalifolium in 1950 and we have photos of the Linnean material to compare. Both belong to var. Oxycoccus as interpreted here. And our usage conforms to that of Gleason, Hitchcock, Forsild, Scoggan, etc. But there has been some divergence of opinion and the opposite interpretation prevails with Breitung, Fernald, Roland, etc.

Our two varieties are often treated as species, but

the diagnostic characters are not quite constant and various recombinations of characters occur here and there. He who would here accept two species will eventually be led to accept four, then perhaps eventually eight!

41. PYROLACEAE (WINTERGREEN FAMILY)

Similar to the Ericaceae. Herbaceous or nearly so. Petals free.

- a. Stem leafy in the lower half 1. Chimaphila
- aa. Leaves all or nearly all in a basal rosette ..
..... 2. Pyrola

1. CHIMAPHILA Pursh.

Flowers in a terminal corymb. Stem leafy, lacking a basal rosette.

1. C. umbellata (L.) Barton var. cisatlantica Blake (var. occidentalis (Rydb.) Blake) -- Pipsissewa, Prince's Pine (Herbe à peigne, Herbe à clef) -- A small shrub, practically herbaceous, with a few large and persistent leaves. Leaves oblanceolate, serrate above the middle. Flowers pink. Early summer. Pine woods, uncommon.--(Aka), NF-(SPM), NS-BC, US.

In Old World var. umbellata the leaves have obtuse to subacute teeth. The american phase is weakly distinguishable by its acute to subacuminate teeth. Also the neogean plants tend to average larger with leaves a bit longer and the nerves more rugose than the paleogean.

We have found the characters of var. occidentalis, mainly the weaker venation, to be too elusive and we have not been able to distinguish this taxon other than by its geography.

2. PYROLA L.

Flowers in a raceme. Plants scapose with a basal rosette.

- a. A single terminal flower 1. P. uniflora
- aa. Flowers in a terminal raceme.
 - b. Style straight and vertical on the top of the ovary.
 - c. Raceme conspicuously secund 2. P. secunda
 - cc. Not at all secund 3. P. minor
 - bb. Style curved and strongly deflexed at the base.
 - d. Leaves denticulate.
 - e. Pedicel much longer than the subtending bract 6. P. picta
 - ee. Bract much longer 7. P. bracteata
 - dd. Leaves crenulate to subentire.

- f. Calyx lobes deltoid, 1.0-1.5 mm long.
 g. Leaves small, thick 4. P. virens
 gg. Leaves larger, thin ... 5. P. elliptica
 ff. Calyx lobes elongate, triangular to lanceolate, 1.5-4.5 mm long.
 h. Flowers pink to crimson.
 8. P. asarifolia
 hh. Flowers white to yellowish green 9. P. rotundifolia

1. P. uniflora L. (Moneses uniflora (L.) Gray) -- Scent-Flower, Jockey-Club -- Small herb with a single terminal white flower. Leaves 8-18 mm long, ovate to round, crenate. First half of summer. Dense coniferous woods.--K-Aka, L-SPM, NS-BC, US, Eur.

2. P. secunda L. var. secunda (var. obtusata Turcz.; Orthilia secunda (L.) House) -- Raceme secund; style straight and long exsert. Leaves broadly ovate, crenulate. Calyx lobes semi-orbicular. Petals greenish. First half of summer. Woods.--G-Aka, L-SPM, NS-BC, US, Eur.

There occurs in Mexico a var. elatio (Lange) Boivin with narrower, more acute and thicker leaves.

The neogean plant shows a broader amplitude of variation than the paleogean and the smaller neogean plants with smaller and more rounded leaves and a sparser inflorescence have been described as var. obtusata. To apply var. obtusata to the whole of the neogean population is certainly unrealistic as most of the American plants fit well within the range of variation of the Eurasian type. To try to segregate the smaller extremes is too arbitrary and somewhat meaningless when our plants obviously form a single population.

3. P. minor L. (var. parviflora Boivin) -- Winter-green, Wood Lily -- Style shortest, 2 mm long or less. Leaves (1)-2-3-(4) cm long, broadly ovate to orbicular, mostly shorter than their petiole. Flowers whitish. Early summer. Wet coniferous woods.--(G), K-Aka, L-NF-(SPM), NS-(PEI)-NB-BC, US, Eur.

Northward and eastward the leaves are commonly smaller, but this tendency proved to be insufficiently marked to allow taxonomic recognition.

4. P. virens Schweigger (P. chlorantha Sw.) -- Blades small, mostly 1-2-(3) cm long, thickish and mostly shorter than their petiole. Flowers greenish. Early summer. Uncommon in dry Conifer forests.--(K)-Mack-(Y-Aka, L-SPM), NS-(PEI)-NB-BC, US, Eur.

5. P. elliptica Nutt. -- Shinleaf, Wild Lily-of-the-Valley -- Leaf thin and large, broadly obovate to elliptic, the blade 3-6 cm long. Flowers white, darkening in drying. Towards mid-summer. Aspen woods.--NF, NS-BC, (eEur).

6. *P. picta* Sm. -- Leaf nervation outlined with a double white line for the central nerve and simple white lines along the main lateral nerves. Leaf denticulate, otherwise rather variable in size and shape. Calyx lobes 1.5-2.5 mm long, deltoid to triangular. Flowers greenish-white to yellowish. First half of summer. Rare, in dry coniferous woods: Waterton.--Alta-BC, US.

7. *P. bracteata* Hooker -- Bract slightly longer than, to twice as long as, the pedicel. Leaves elliptic to suborbicular, denticulate through the nerves being short-excurrent. Nerves sometimes lightly outlined in white. Calyx lobes 3.0-4.5 mm long, lanceolate. Flowers pink to crimson. Anthers yellow to pink. Early summer. Damp coniferous woods.--swAlta-BC, US.

8. *P. asarifolia* Mx. (var. incarnata (DC.) Fern., var. purpurea (Bunge) Fern.; *P. californica* Krusa; *P. uliginosa* T. & G.) -- Pink Wintergreen -- The common species with pink to crimson flowers. Leaves round to reniform, crenulate to subentire. Nerves ending at the bottom of the sinuses. Bracts about as long as, to much shorter (especially the upper) than, the pedicels. Calyx lobes 1.5-3.5 mm long, triangular. Petals pink to rose, deepening in drying. Anthers pink to crimson. First half of summer. Woods.--K-Aka, L-NF, NS-BC, US, Eur.

The leaf shape varies in a continuous manner and segregates such as var. purpurea or *P. uliginosa* appear to be both arbitrary and sympatric.

9. *P. rotundifolia* L. (var. americana (Sweet) Fern.; *P. americana* Sweet; *P. grandiflora* Radius, var. canadensis (H. Andres) Pors.) -- Wintergreen, Wild Lily-of-the-Valley (Muguet des bois, Verdure d'hiver) -- Much like the preceding but the flowers white or nearly so, drying yellowish or greenish or dirty green. Leaves suborbicular. Calyx lobes 3-4 mm long, lanceolate, pinkish. Anthers yellow, sometimes pink. Early summer. Mostly dry woods.--G-Aka, L-SPM, NS-BC, US, Eur.

Usually subdivided into 3 taxa of which *P. americana* and *P. grandiflora* are American while the largely Eurasian *P. rotundifolia* is also reported as cisatlantic towards the northeast. We have been unable to detect here any essential difference except that the more northern specimens (*P. grandiflora* or var. pumila (Horn.) Hooker) tend to be smaller. The amphiatlantic *P. rotundifolia* is supposed to differ from the cisatlantic *P. americana* in a number of characters of floral mensurations, but our Eurasian specimens at DAO did not conform to this dichotomy and we were unable to find any tangible characters other than the amplitude of variation in the length of the anthers which is lesser in Eurasian (2.0-3.0 mm) than in American specimens (1.7-3.5 mm). Hence the present consolidation.

42. MONOTROPACEAE (INDIAN PIPE FAMILY)

Parasitic herbs, fleshy and devoid of green colour.
Leaves reduced to fleshy scales. Ovary superior.

- a. Petals free 1. Monotropa
aa. Petals fused into a campanulate corolla .. 2. Pterospora

1. MONOTROPA

INDIAN PIPE

Petals free. Sepals vestigial or missing. Anthers awnless. Plants odd-coloured and often mistaken for mushrooms.

- a. A single terminal flower 1. M. uniflora
aa. Flowers in a terminal raceme 2. M. Hypopithys

1. M. uniflora L. -- Indian-Pipe, Ghost-Flower -- A waxy-white and almost translucent simple herb with a nodding flower of similar texture, the whole plant turning jet black in drying. Sometimes pinkish; becoming somewhat woody in fruit. Late summer and early fall. Parasitic on roots of Conifers.--(Aka), L-SPM, NS-BC, US, (CA), Eur.

2. M. Hypopithys L. (ssp. lanuginosa (Mx.) Breitung, var. latisquama (Rydb.) Kearney & Peebles; Hypopithys latisquama Rydb.) -- Pinesap (Sucepin) -- The whole plant orange-coloured or similarly tinted. Pubescent. Drying brownish black. Flowers in a nodding terminal raceme. Late summer or early fall. Parasitic on roots of Conifers, not so common as the preceding.--Aka, NF-SPM, NS-O, swS-BC, US, CA, Eur.

We have been unable to detect any constant differences that could justify the distinction of a transatlantic var. Hypopithys from a western var. latisquama and an eastern ssp. lanuginosa.

2. PTEROSPORA Nutt.

PINE-DROPS

Petals fused into an urceolate corolla. Anthers awned. Sepals present, fused at base.

1. P. andromeda Nutt. -- Brownish herb, simple and densely glandular-pubescent. Up to 1 m tall. Flowers on elongate recurved pedicels in an elongate raceme. Flowers yellow and purple. Mid summer. Parasitic on Conifers: Rockies, Cypress Hills.--(seAka), PEI, swQ-O, swS-BC, US, (CA).

Rare, highly sporadic and perhaps producing flowering stems only at intervals of many years. Hence rarely collected and we see no reason to dispute the accuracy of the general distribution given above.

43. DIAPENSIACEAE

(DIAPENSIA FAMILY)

Like the Ericaceae, but the stamens adnate to the corolla.

1. DIAPENSIA L.

No staminodia. Flower solitary.

1. *D. lapponica* L. -- Moss-Lily, Ground Ivoryflower
 -- Dwarf shrub, low and much branched into a loose or compact cushion. Glabrous. Leaves linear, entire, crowded, marcescent. Flower yellowish green, marcescent, subtended by 3 bracts, solitary and borne on a long, exserted peduncle. Mid summer. Dry tundra.--G-Aka, L-SPM, NS, Q, nMan, US, Eur.

Order 26. CELASTRALES

Petals free, subtended by the small fused calyx. Ovary superior, usually with a disk. Stamens as many as the petals and alternating with them. Leaves simple.

- a. Leaves evergreen 44. Empetraceae
 aa. Leaves deciduous 45. Celastraceae

44. EMPETRACEAE (CROWBERRY FAMILY)

Low shrubs with evergreen leaves. Ovary superior and maturing into a berry similar to that of Vaccinium.

1. EMPETRUM L. CROWBERRY

Leaves acicular, subverticillate. Flower trimerous, bracteolate.

1. *E. nigrum* L. var. purpureum (Raf.) DC. (var. hermaphroditum (Lange) Sørensen) -- Blackberry, Crowberry (Graïnes noires, Crottes de corneille) -- Carpet-making shrub with some leaves alternate, some opposite, most subverticillate. Leaves linear-oblong, (3)-5-(7) mm long, minutely glandular-ciliate. Flower small, purple. Fruit purple, turning black. Late spring. Bogs, tundras and rocky places.--(G)-F-Y-(Aka), L-(NF-SPM), NS-(PEI)-NB-Alta-(BC), US, (Eur).

In our variety the flowers are perfect or rarely polygamous and the branchlets are finely glandular or sometimes lightly brownish-tomentose. The anthers are marcescent and normally persist at the base of the fruit; the floral type is thus readily determined in most herbarium specimens. In the paleogean var. nigrum the branchlets and leaves are glabrous while the flowers are dioecious and the fruit is black.

45. CELASTRACEAE (STAFF-TREE FAMILY)

Seeds surrounded by a fleshy or membranous aril.

- a. Leaves alternate 1. Celastrus
 aa. Opposite 2. Pachystima

1. CELASTRUS L. STAFF-TREE

Woody climbers by twining stems. Flower functionally unisexual, 5-merous.

DIAPENSIA

1. C. scandens L. -- Bittersweet (Hourreau des arbres)
 -- The woody stems becoming quite thick and hard, eventually strangling the host shrub or tree. Leaves ovate to elliptic, serrate, abruptly acuminate. Flowers small, yellowish-green, mostly in a terminal raceme. Fruit orange, opening by three valves and exposing the bright red arils. The mature fruits used for decoration. Early summer. Woods, mostly sand dunes and galerie-forests; Estevan and eastward. --NB-seS, US.

2. PACHYSTIMA Raf.

Non climbing, but a low shrub with opposite evergreen leaves. Flower 4-merous.

1. P. myrsinites (Pursh) Raf. -- Mountain-Box, False Box--Low shrub with numerous small leaves, 1-3 cm long, ovate to lanceolate, serrulate, subsessile, leathery. Flowers reddish, small, axillary. Fruit not seen. Late spring. Coniferous woods.--Alta-BC, US.

Order 27. SANTALALES

Ovary inferior and the perianth reduced to a single verticil of fused parts. Stamens opposite the perianth lobes. Parasitic plants.

- a. Parasitic on branches of Conifers 46. Loranthaceae
 aa. Terrestrial and not so obviously parasitic 47. Santalaceae

46. LORANTHACEAE (MISTLETOE FAMILY)

Parasitic plants, devoid of roots and growing on branches of trees and, when present in abundance, deforming them into witch-brooms. Leaves reduced, opposite. Fruit sticky.

1. ARCEUTHOBIMUM Bieb.

Leaves opposite, connate and reduced to a small sheath at each node. Flowers dioecious, much reduced and insignificant.

- a. Plant light green 1. A. americanum
 aa. Plant blackish 2. A. pusillum

1. A. americanum Nutt. -- Growing on the branches of Pinus Banksiana and usually shorter than the needles. Stem branched, often tufted.--Man-BC, US.

2. A. pusillum Peck -- Dwarf Mistletoe -- Growing hidden among the needles of Picea mariana. Stem usually simple and shorter than the needles, often a mere 1-3 mm in length. --NF, NS-Man, US.

47. SANTALACEAE (SANDALWOOD FAMILY)

Similar to the Mistletoes, but terrestrial and not al-

ways parasitic on roots of other plants. Leaves alternate. Fruit indehiscent, a nut or slightly fleshy drupe. A single genus with us.

1. COMANDRA Nutt.

BASTARD TOAD-FLAX

Long stoloniferous herbs with alternate leaves. Sepals and stamens 5.

- a. Inflorescence terminal 1. C. umbellata
 aa. Flower axillary 2. C. livida

1. C. umbellata (L.) Nutt. var. umbellata (C. Richardsiana Fern.) -- Calyx lobes whitish and more or less giving their color to the flowering corymbs. Otherwise a rather inconspicuous plant. Glabrous. Stem (1)-2-(3) dm high, nearly simple. Leaves lanceolate, entire, thin, paler and somewhat glaucous below, often slightly revolute at margin. Calyx lobes 2-3 mm long, triangular to oblong. Fruit greenish, 3-6 mm across. Late spring. Common in open, grassy places.--L-NF, NS-BC, US -- Var. angustifolia (A.DC.) Torrey (C. pallida AA.) -- Like the preceding, but the leaves thickish, slightly fleshy, somewhat glaucous on both faces. Nervation indistinct or nearly so, not rugose. Calyx lobes mostly larger, (2)-3-4 mm long. Fruit bigger, 5-8 mm across.--Man-Alta, US -- Var. pallida (A. DC.) G.N. Jones -- Generally somewhat taller and commonly 3-4 dm high. Branches usually numerous, elongated and bearing leaves that are much narrower than the stem ones, the latter as in var. angustifolia. Flowers in a corymb or more often in a panicle. Calyx and ovary connected by a well defined neck about 2 mm long. Calyx lobes 3-4-(5) mm long. Fruit with a neck 1-2 mm long.--swAlta-BC, US.

Our treatment is different in one way or another from any of the current floras. We have been unable to maintain Comandra Richardsiana as a consistent segregate. But we have distinguished the prairie phase from both the eastern phase and the mountain one, while most authors will lump this prairie phase now with the eastern, now with the western type.

Most specimens of the prairie phase will be found identified as C. pallida, but reading the description of De Candolle, studying photos of his specimens and considering the geographical origin of the type collection, it becomes clear that such usage must be erroneous.

C. pallida has also been reported by many authors, Hultén 1944, 1950, Anderson 1946, Porsild 1951, Scoggan 1957, from the Dawson area of Yukon, but we have yet to see the cited specimens and are not therefore in a position to decide upon their varietal appertenance. There is also a Mackenzie collection of var. angustifolia labelled "MacTavish, on Anderson River near Port Hope" (CAN) which we consider to be questionable as to locality because it is so far removed from the rest of the range and has never been confirmed.

2. C. livida Rich. (Geocaulon lividum (Rich.) Fern.) -- A simple herb usually bearing a single red fruit borne half way up on a long axillary peduncle. Glabrous. Leaves ovate to elliptic-lanceolate, entire. Flowers green to reddish, few or solitary in a single or a few axillary inflorescences. Fruit a red and fleshy drupe. Late spring. Usually in wet places or coniferous woods.--K-Aka, L-NF, NS, NB-BC, US.

Order 28. RHAMNALES

Similar to the Santalales, but the petals present and the stamens opposite them or, if the petals are absent, the stamens alternate with the calyx lobes.

- a. Foliage stellate-pubescent 49. Elaeagnaceae
- aa. Pubescence, if any, not stellate.
 - b. Inflorescence axillary or terminal 48. Rhamnaceae
 - bb. Inflorescence borne opposite a leaf 50. Vitaceae

48. RHAMNACEAE (BUCKTHORN FAMILY)

Flower perigynous with a well developed disk. Petals generally clawed and more or less hooded over the stamens.

- a. Inflorescence axillary 1. Rhamnus
- aa. Inflorescence terminal 2. Ceanothus

1. RHAMNUS L.

BUCKTHORN

Fruit fleshy, indehiscent. Petals reduced or lacking.

- a. Spinescent, the terminal buds opposite and flanking a short spine 2. R. catharticus
- aa. Not spiny; terminal bud solitary.
 - b. Leaves serrate 1. R. alnifolius
 - bb. Entire or nearly so 3. R. Frangula

1. R. alnifolius L'Hér. (R. alnifolia sphalm.) -- Dwarf Alder -- Colonial shrub, decumbent at base, the flagellate branches leafy at tip only. Leaves ovate to elliptic-lanceolate, usually short acuminate, all alternate. Flowers small, greenish, few, without petals. Fruit a black berry. Late spring. Marshy woods and bogs.--NF, NS-BC, US.

Nearly all latin names of trees and shrubs are of the feminine gender, but there are a few exceptions and Rhamnus is one of them. So are Acer, Ceanothus, Ribes, Viburnum, etc.

2. R. CATHARTICUS L. -- Buckthorn (Epine noire, Bois noir) -- Small tree or shrub with lateral branches ending in a short sharp spine flanked by two opposite buds. Leaves ovate, serrulate, most of the leaves opposite or subopposite and usually with a few of the lower leaves alternate. Petals small, greenish or deep red. Berries black. Late spring. Sometimes planted and readily naturalizing itself in the nearby bush.--NS-PEI-(NB)-Q-S, US, Eur.

3. *R. FRANGULA* L. -- Black Dogwood, Black Alder (Bourgène, Aulne noir) -- A shrub with alternate leaves, except that those of the upper 1-2 pairs are opposite or subopposite. Leaves ovate, entire, shining below. Petals small, whitish. Fruit hardly fleshy, purple-black. First half of summer. Well naturalized in one ravine in Brandon.--NS-Man, US, Eur.

2. *CEANOTHUS* L.

NEW JERSEY TEA

The petals long-clawed and conspicuously hooded over the stamens. Fruit a capsule separating at maturity into 3 dehiscent 1-seeded carpels. Leaves with 3 main nerves, parallel to converging, and about equally strong.

- a. Leaves lanceolate 1. *C. ovatus*
 aa. Leaves ovate to elliptic 2. *C. velutinus*

1. *C. herbaceus* Raf. (*C. ovatus* Desf.) -- Lanceolate leaves with 3 main nerves. Low branchy shrub. Leaves glabrous to velvety, glandular-serrate, the glands dark purple. Flowers white, umbellate, most of the umbels closely inserted on a short rachis, forming a terminal corymb borne on a long peduncle. Early summer. Semi-open sandy places.--swQ-seMan, US.

2. *C. velutinus* Douglas var. *velutinus* -- Snow-Brush, Deer-Brush -- Strongly resin-scented. Leaves persistent into the following summer, the new leaves not appearing until flowering time, the old leaves falling off in the latter part of the summer. Soft puberulent on the twigs and lower surface of the leaves. Flowers white, in numerous umbels, gathered in ill-defined panicles. Early summer. Light woods on dry soils.--swAlta-BC, US.

The more western var. *laevigatus* (Hooker) T.&G. is glabrous.

49. *ELAEAGNACEAE*

(OLEASTER FAMILY)

Shrubs with the lower leaf surfaces and other parts densely covered with scale-like stellate hairs which give the plant a silvery or otherwise unusual appearance.

- a. Leaves opposite 2. *Shepherdia*
 aa. Leaves alternate.
 b. Calyx lobes 2 1. *Hippophae*
 bb. Calyx lobes 4 3. *Elaeagnus*

"

1. *HIPPOPHAE* L.

SEA BUCKTHORN

Calyx lobes 2; stamens 4.

1. *H. RHAMNOIDES* L. -- Sea-Buckthorn, Willow-Thorn (Argousier, Epine luisante) -- Winter buds bilobed. Spinescent shrub. Leaves linear, green above, white-stellate below with some admixture of brown stellate hairs. Fruit brown-stellate. Mid-spring. Sometimes cultivated and locally escaped in the coulée of the Saskatchewan at Edmonton.--cAlta, Eur.

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2. SHEPHERDIA Nutt.

Calyx lobes 4; stamens 8. Leaves opposite.

- a. Twigs brown-stellate 1. S. canadensis
 aa. Twigs silvery-stellate 2. S. argentea

1. S. canadensis (L.) Nutt. -- Scoopalalie, Bitter Berries
 -- The opposite leaves white-stellate below and dotted with numerous red-brown stellate hairs. Not spiny. Leaves oblong, green and nearly glabrous above. Flowers small, brownish. Fruit a fleshy drupe, bright red, nearly glabrous. Early spring. Usually in wet places and mostly in open woods.--K-Aka, (L)-NF, NS, NB-BC, US.

2. S. argentea Nutt. -- Buffalo-Berry, Bullberry (Graines de boeuf) -- Ferociously spiny shrub with stiff, right-angled branching, the branches mostly opposite. Leaves oblong-lanceolate, densely stellate-pubescent, grayish-green above, grayish-white below. Flowers small, densely brown-stellate. Fruit as in the preceding. Early spring. Steep coulée banks.--sMan-Alta, US.

3. ELAEAGNUS L.

OLEASTER

Calyx lobes 4; stamens 4.

- a. Twigs brown-stellate 1. E. commutata
 aa. Twigs white-stellate 2. E. angustifolia

1. E. commutata Bernh. (E. argentea Pursh) -- Wolf-Willow, Silver-Berry (Bois d'argent) -- A common and showy silvery-leaved shrub. Stoloniferous and forming large colonies in the prairie, mostly about 1 m high. Leaves elliptic, silvery-white on both faces, but whiter below and with a few red-brown scales. Flower silvery outside, yellowish-green inside. Fruit silvery-white. Early summer. Prairies, usually on chernozems.--K-Aka, Q-BC, US.

2. E. ANGUSTIFOLIA L.-- Russian Olive, Oleaster (Olivier de Bohème, Olivetier) -- Spiny shrub, most spines being paired with a leafy shoot borne at the same node. Leaves lanceolate, green above, shining silvery below. Flowers white-silvery outside, green inside. Fruit silvery, the size of a small olive. Early summer. Sometimes planted and commonly naturalized on river shores further south, more locally so with us.--O-Man, (Alta)-BC, US, Eur.

50. VITACEAE

(VINE FAMILY)

Climbing shrubs, ours climbing by tendrils borne opposite the leaf.

- a. Leaf simple 1. Vitis
 aa. Leaf compound 2. Parthenocissus

1. VITIS L.

GRAPE

Petals fused and falling off as a unit before anthesis. Climbing shrubs bearing panicles of edible fruits called "grapes".

1. V. riparia Mx. (V. palmata AA.; V. vulpina AA.) -- Grape, Frost-Grape (Vigne, Vigne des battures) -- Woody climber with palmately-nerved leaves. Climbing to the top of the trees, its trunk up to 2-3 cm in diameter. Leaves alternate, broadly cordate, more or less 3-5 lobed, coarsely toothed. Fruit black with a bluish bloom. Early summer. Galerie-forests.--NS, NB-sMan, US.

2. PARTHENOCISSUS Planchon

Petals free and remaining until after anthesis.

1. P. quinquefolia (L.) Planchon (Pseodera quinquefolia (L.) Greene) -- Virginia-Creeper (Vigne vierge) -- A woody climber with a large digitate leaf. Climbing into trees by means of branched tendrils that end in adhesive disks 1.5-3.5 mm wide. Leaf long-petioled, with 5 leaflets, the latter short-petioled, ovate to broadly oblanceolate, coarsely dentate. Early summer. Floodplain forests.--(NS-NB)-Q-O-(sMan, US, CA) -- F. macrophylla (Lauche) Boivin (P. inserta (Kerner) K. Fritsch) -- Tendrils merely twining, not producing adhesive disks.--(NS)-PEI-(NB)-Q-O-(Man, US).

Order 29. LOGANIALES

Sepals fused and the petals also fused. Stamens borne on the corolla and alternating with the corolla lobes. Ovary superior. Flower actinomorphic.

51. OLEACEAE

(OLIVE FAMILY)

Stamens only 2.

a. Leaves compound 1. Fraxinus
aa. Simple 2. Syringa

1. FRAXINUS L.

ASH

Fruit a paddle-shaped samara. Flowers much reduced, the calyx minute and the petals lacking.

a. Leaflets 5-7 1. F. pennsylvanica
aa. Leaflets 9-13 2. F. nigra

1. F. pennsylvanica Marsh. var. Austinii Fern. -- Ash, River-Ash, (Frêne, Frêne rouge) -- River shore tree with opposite and compound leaves, mostly with 7 leaflets. Buds gray-brown. Branchlets short-velvety, the rachises and lower surface of the leaflets more or less pubescent. Leaflets lanceolate, serrate, the lower with a short petiole. Samara flat and

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broadly above, terete and much narrower below. Early spring. Shores and floodplains.--NS, NB-Man, US -- Var. subintegerrima (Vahl) Fern. (var. lanceolata (Borkh.) Sarg.; F. campestris Britton) -- Green Ash (Frêne vert) -- Twigs, rachises and leaflets glabrous.--NS-PEI, Q-S, US.

Reports by Scoggan 1957 of var. Austinii from Saskatchewan and of var. subintegerrima from Alberta would seem to be creditable to a lapsus calami, according to Scoggan (verbatim).

2. F. nigra Marsh. -- Black Ash, Swamp Ash (Frêne noir, Frêne gras) -- Tree with large jet-black buds. Much as in the preceding, but the leaflets more numerous and sessile. Samara flat throughout, oblong-lanceolate and not particularly wider above than below. (Early spring?). Marshy woods.--NF, NS-Man, US.

2. SYRINGA L.

LILAC

Fruit a capsule. Corolla showy.

1. S. VULGARIS L. -- Lilac (Lilas; Arbre de lilas) -- Shrub with a showy panicle of sweet-scented tetramerous flower. Leaves opposite, glabrous, deltoid-ovate and entire, the base truncate to subcordate. Early summer. Sometimes planted and rarely persisting on moister sites: Moose Jaw.--NF-(PEI-NB)-Q-O, S, US, Eur.

Order 30. APOCYNALES

Much as in the Loganiales, but the two carpels fused by their styles only.

- a. Flower of a standard type 52. Apocynaceae
- aa. Flower very complex, with corona, horns and pol-
linia 53. Asclepiadaceae

52. APOCYNACEAE

(DOGBANE FAMILY)

A typical and unspecialized pentamerous flower with a calyx and corolla of fused parts and a bicarpellate ovary.

1. APOCYNUM L.

DOGBANE

Herbs with very abundant white latex, opposite leaves and twinned pendent fruits.

- a. Corolla 5-6 mm long, pink, or white with pink lines 1. A. androsaemifolium
- aa. Corolla 2-4 mm long, greenish-white, without pink lines 2. A. cannabinum

1. A. androsaemifolium L. var. incanum A. DC. (var. glabrum AA.; A. scopulorum Greene) -- Dogbane, Flytrap (Herbe à puce, Gobe-mouche) -- Dichotomously branched, the stem 3-7 dm high, overtopping the branches. Main leaves mostly ovate or su-

borbicular, 5-6 cm long, cuneate to rounded at base, more or less pubescent below, short petiolate. Flowers campanulate, mostly drooping or pendent. Calyx lobes deltoid or lanceolate, 1/3 or 1/4 the length of the corolla tube. First half of summer. Open places, mostly on hillsides.--Mack-Aka, NF, NS-BC, US, (CA) -- Var. Woodsonii Boivin -- Generally smaller and with erect fruits. Mostly 2-4 dm high. Leaves about 2-4 cm long, pubescent below, often subcordate at base: Waterton.--swAlta-BC, US -- Var. pumilum Gray -- Like the last, but glabrous throughout. Cypress Hills.--seAlta-BC, US.

There has been some tergiversation as to the application of var. androsaemifolium. It was originally described as having leaves glabrous on both faces by Linnaeus and the name was used in that sense until Woodson, *Rhodora* 34: 30-31. 1932 pointed out that the glabrous phase was known only from the western parts of North American, well outside the area of origin of the material available to Linnaeus. Woodson concluded that the typical phase cannot be anything but the common and pubescent eastern plant later described as var. incanum by De Candolle. However it was pointed out by Boivin 1966 that glabrous plants do occur also in eastern Canada and the glabrous specimen of the Hortus Cliffortianus cannot be ignored. We have accordingly returned to the older practice of distinguishing a var. incanum from the typical and glabrous var. androsaemifolium.

1. X. A. medium Greene -- Very variable hybrid of our two species. Commonly with narrower leaves than the above and rounded to cuneate at base, often petiolate, but usually glabrous. Calyx lobes most often as long as the corolla tube. Flowers variable, mostly large and white to pink-lined, but usually tubular with erect lobes.--NF, NS, NB-BC, US.

2. A. cannabinum L. var. hypericifolium Gray (nec Aiton) Gray; A. cannabinum AA.; A. sibiricum Jacq., var. cordigerum (Greene) Fern., var. salignum (Greene) Fern.) -- Indian Hemp (Chanvre sauvage) -- Coarser, about 1 m high, with opposite branching and the branches overtopping the stem at anthesis. Glabrous throughout. Stem leaves mostly 6-8 cm long, sessile, subcordate. Branch leaves smaller and narrower. Flowers 2-4 mm long, tubular, yellowish-white, with long calyx lobes. Late spring to mid-summer. Shores and open places.--Mack, NF, NS, NB-BC, US -- F. arenarium (F.C. Gates) Boivin (A. sibiricum Jacq. f. arenarium (F.C. Gates) Fern.) -- Half smaller and decumbent at base. Shores subjected to violent spring floods.--NF, NS, NB-O, S-Alta, (US).

Usually subdivided into two species, each with two varieties, but as pointed out by Boivin 1966 the distinction is not realistic and the entity currently distinguished as A. cannabinum var. glaberrimum A.DC. is not substantially distinct from the typical phase of A. sibiricum. Hence the present usage.

53. ASCLEPIADACEAE

(MILKWEED FAMILY)

Pollen grains adnate into pollinia in the manner of the APOCYNUM

Orchidaceae. Pollinia attached in 2's to black translators. Anthers and stigmas fused together to form a platform termed "gynostegium". Otherwise as the Apocynaceae and equally productive of an abundant milky juice.

1. ASCLEPIAS L.

MILKWEED

Complex flower with a supplementary pseudo-corolla termed a "corona". This corona is formed of 5 large, petaloid, conspicuous hooded appendices which arise from the back of the largely hidden filaments of the anthers. Each hood bears inside a secondary appendix termed a "horn", from its obvious shape.

a. Leaves filiform, verticillate 5. A. verticillata
 aa. Leaves broader and essentially alternate to

opposite.

b. Flower purplish.

c. Glabrous or nearly so 1. A. incarnata

cc. Velvety puberulent throughout.

d. Hoods very long and showy,

over 1 cm long 4. A. speciosa

dd. Hoods less than half as long 3. A. syriaca

bb. Flower greenish to yellowish-white.

e. Stem coarsely spreading-hirsute... 7. A. lanuginosa

ee. Stem finely recurved-puberulent.

f. Hoods overtopping the gynostegium

by about half their length.... 2. A. ovalifolia

ff. Hoods much lower, about reaching
 the level of the gynostegium ..

..... 6. A. viridiflora

1. A. incarnata L. var. incarnata -- Swamp-Milkweed --
 With a showy terminal umbel (or corymb of umbels) of deep purple flowers. Glabrous except in the inflorescence. Leaves lanceolate to narrowly lanceolate, opposite or sometimes verticillate in the inflorescence. Flowers less than 1 cm long. Fruit glabrous and spineless. Mid summer. Shores and ditches. -- NS-sMan, US.

Mentioned for Saskatchewan by Britton 1913 and Groh 1947, but not in the more recent floras. Source of report is not known to us.

In our variety the stem is glabrous and the leaves are glabrous or nearly so below. In Nova Scotia, and more locally inland, there occurs a var. pulchra (Ehrh.) Pers. more or less pubescent on the stem and both faces of the leaves; the latter are also often larger.

2. A. ovalifolia Dcne. -- The common prairie species, the flowers whitish and the stems usually less than 5 dm high. Finely recurved pubescent throughout. Leaves very variable, mostly ovate and opposite. Umbels loosely flowered. Peduncles green, 1.5-3.0 cm long. Fruit spineless. First half of summer. Well drained prairies, often on sandy soil. -- wO-Alta, US.

3. A. syriaca L. var. syriaca -- Milkweed, Silkweed (Cotonnier, Cochons de lait) -- A coarse sticky herb with dense globular clusters of purple flowers. About 1 m high and densely short glandular-pubescent throughout. Leaves 1-2 dm long, about oblong, opposite. Peduncles purple, 2-3 cm long. Fruit densely covered with soft spine-like projections. First half of summer. Floodplains. -- NS-sMan, US.

In var. syriaca the stem leaves are mainly subcordate at base. To the south of us it is largely replaced by a var. kansana Palm. & Stey. with leaves rather truncate at base and fruits covered with thinner and \pm filiform spine-like projections.

Saskatchewan is included in the range given by Fernald 1950, but we found no corresponding specimen at HUH in 1965.

A. syriaca x speciosa was listed by Löve 1959 for southern Manitoba on the basis of J.P. Bernard, Otterburne (MSM; DAO, photo). This specimen is not obviously different from typical A. syriaca.

4. A. speciosa Torrey -- Very conspicuous flowers, with the hood elongated to 10-15 mm. Much like the preceeding, but more densely pubescent, becoming white-lanate in the inflorescences. Leaves ovate to oblong. Peduncles 2-3 cm long. Overall length of the flower around 2 cm. Pods reputedly spiny, like the preceeding, but none of our material is fruiting. Early to mid-summer. Wetter spots in the prairie; occurring in widely scattered colonies, often along roadsides, but seems to be native. -- sMan-sBC-US.

5. A. verticillata L. -- Leaves linear-filiform and mostly verticillate in whorls of about 5-6. Stem 1-6 dm high, more or less pubescent in lines. Leaves glabrous to puberulent, strongly revolute, numerous. Peduncles 1 cm long or less. Flowers small, greenish-white, in a terminal corymb or panicle of umbels. Fruit glabrous and spineless. Mid-summer. Prairies on chernozems; rare, from Estevan eastward. -- swO-sMan-seS, US, (CA).

6. A. viridiflora Raf. var. viridiflora (var. lanceolata (Ives) Torrey, var. linearis (Gray) Fern.; Acerates angustifolia (Nutt.) Dcne.; Acerates lanuginosa AA.; Acerates viridiflora (Raf.) Eaton, var. lanceolata (Ives) Gray, var. linearis Gray) -- Green Milkweed. -- Hoods not developing horns. Exceptionally variable. 2-6 dm high. Puberulent throughout. Leaves lanceolate to long-linear, mostly opposite. Umbels mostly 2-3, rather densely flowered, axillary, or one of them sometimes terminal. Peduncles 1.0-1.5 cm long. Flowers greenish-white. Fruit spineless. First half of summer. Sandhills. -- O-S-(sAlta), US -- Var. obovata (Ell.) Torrey (A. viridiflora AA.) Leaves broader, ovate to oblong-lanceolate. -- (O)-Man-S-(Alta), US.

Var. obovata is of doubtful value. It might be nothing more than an ecological variant.

7. A. lanuginosa Nutt. (Acerates lanuginosa (Nutt.) Dcne.)

-- Inflorescence a single terminal umbel. Otherwise similar to the preceding, but coarsely hirsute throughout. Leaves \pm lanceolate, alternate to subopposite. (Early summer?). Sandhills of the Agassiz delta. -- sw0-scMan, US.

A rather rare plant in Canada, it has been collected only at Sidney, Aweme, Pointe Pelée and Grand Bend.

Order 31. RUBIALES

Like the Loganiales, but the ovary inferior. Leaves opposite or verticillate.

- a. Herbs 54. Rubiaceae
 aa. Shrubs 55. Caprifoliaceae

54. RUBIACEAE

(MADDER FAMILY)

Leaves either verticillate or opposite and stipulate.
 Mostly woody plants with entire leaves, but ours all herbs.

- a. Leaves opposite 1. Houstonia
 aa. Leaves verticillate.
 b. Flowers in an open cyme 3. Galium
 bb. In an involucre head 2. Asperula

1. HOUSTONIA L.

BLUETS

Small herbs with 4-merous, opposite leaves and interpetiolar stipules, that is stipules alternating with the leaves, there being only 2 stipules for each pair of leaves, instead of the normal pair of stipules to each leaf.

1. H. longifolia Gaertner var. longifolia -- Bluets -- Tufted perennial, the erect stems up to 2 dm high. Leaves 1-3 cm long, \pm lanceolate, glabrous or sometimes very minutely scabrous along the margin. Flower 5-8 mm long, funnelform, pale blue. Late spring and very early summer. Dry and sandy prairies. -- sQ-seS, US -- Var. Musci Boivin -- Basal leaves sparsely and irregularly ciliate along the petiole and towards the base of the blade. -- sMan-cAlta.

A study of the genus published in Rhodora 61: 157-180, 188-207. 1959 dealt primarily with the U.S. species. We found the Canadian material to fall readily into two species, an eastern H. caerulea L. and a more widespread H. longifolia. The latter could be further subdivided on minutiae of pubescence into four geographical variations as follows:

- a. Basal leaves glabrous and eciliate or at most very finely scabrous var. longifolia
 aa. More or less ciliate.
 b. Ciliate with hairs 0.3-0.5 mm long; stem nearly always glabrous var. ciliolata
 bb. Ciliation of shorter hairs; stem glabrous or more commonly hirsute.

- c. Stem glabrous at least along the internodes; rosette leaves irregularly and sparsely ciliate var. Musci
- cc. Lower part of the stem hirsute on the internodes and along the lines of decurrence; leaves uniformly short-ciliate...var. Soperi

Two varieties occur in the U.S.A. Var. longifolia has the basal leaves quite glabrous or at most finely scabrous with minute hairs less than 0.1 mm long and barely detectable with the hand lens; stems mostly glabrous or sometimes more or less hirsute along the lines of decurrence, especially in the vicinity of the nodes. This first variety also occurs in Canada in Quebec (Richmond Co.), Ontario (Kenora, Middlesex, Rainy River and Simcoe Cos.), Manitoba (Macdonald, Marquette, Neepawa, Provencher and Springfield districts) and Saskatchewan (Melville, Rhostern and Yorkton districts).

Var. ciliolata (Torrey) stat. n., H. ciliolata Torrey, Fl. N. US. 1: 173.1824; H. canadensis W. Basal and stem leaves regularly ciliate with longer hairs. Stem nearly always glabrous. This second variety is much more restricted in its Canadian distribution; we know it only from the following Ontario counties: Bruce, Frontenac (Westbrook), Lincoln, Northumberland and Welland.

The last two varieties are strictly Canadian in their distribution and by their morphology they seem to be intermediate between the first two varieties. Yet it is remarkable that these two Canadian varieties are absent from the area of overlap of the first two varieties.

Var. Musci var. n. Folia rosettae sparse et irregulariter ciliata, saepius ad basas et secundum petiolum. Caulis glaber vel ad basas ± hirsutus secundum lineas, praecipue ad nodos, glaber tamen in internodiis. Type: Boivin, Moss, Turner & Alex 10176, Bruderheim, 2 miles north, Pinetum Banksianae on fixed sand dunes, Aug. 18, 1952 (DAO); Paratypes: Manitoba: H. Marshall 34, Brandon, (DAO); Boivin & Dore 8263, Shilo, (DAO); F. Fyles, Treesbank, (DAO); H. Groh, Aweme, "Bluets", (DAO); Frankton & Bibbey 97, Shilo (DAO); Boivin & Alex 9290, Saint-Lazare, (DAO); J.S. Rowe 510, East Gate, Riding Mountain National Park, "Bluets", (DAO); Löve & Love 5546, Pointe du Bois, (DAO); Boivin & alii 10658, Brokenhead, (DAO); Boivin, Laishley & Schindler 13042, Réserve Forestière Whiteshell, coté nord du lac Falcon, (DAO); SASKATCHEWAN: A.J. Breitung 591, McKague, (DAO); A.J. Breitung s.n., McKague, (DAO); G.W. Sel-leck 76, Esterhazy, (DAO); A.J. Breitung 8475, 12 mi. n. of Meadow Lake (DAO); R.C. Russell 54447, Macdowall (DAO); Ledingham & Hudson 910, Price Albert (DAO); Boivin & Breitung 6114, Nisbet Provincial Forest (DAO); Senn, Groh & Russel 2803, St. Louis (DAO); ALBERTA: E.H. Moss 1002, near Edmonton, (DAO); E.H. Moss 10257, north of Ft. Saskatchewan (DAO).

So named after the late E.H. Moss, author of an excellent manual on the flora of Alberta.

Var. Soperi var. n. Folia rosettae breviter ciliata pilis 0.2-0.3 mm. Caullis ad basas hirsutus secundum lineas et in internodiis. Type: J.H. Soper 588, Turkey Pt., sandy banks along edge of dry upland woods, July 4, 1938 (DAO); Paratypes: ONTARIO: T.W. Burgess, Burford (DAO); Victorin, Rolland & Dominique 46377, Normandale, (DAO); Victorin, Rolland & Dominique 46424, Saint Williams, (DAO); W.G. Dore 44-27, Walsingham, (DAO); J. Dearness, West of Simcoe (DAO).

2. ASPERULA L.

Much like Galium with a well defined tube to the corolla.

1. A. ARVENSIS L. -- Quinsywort (Rapette) -- Inflorescence a glomerule of pale blue flowers subtended by an involucre of very long ciliate and narrowly oblanceolate bracts. Nearly glabrous annual with a red taproot. Leaves in 6's or 8's. (Early summer?) Rare adventive: Delta. -- O-Man, BC, (US), Eur.

Only 2 other localities in Canada: Hamilton and Essondale.

3. GALIUM L.

BEDSTRAW

Fruit geminate, yet born of a single flower. Herbs, often catchy, with verticillate leaves.

- a. Ovary and fruit densely pubescent.
 - b. Leaves in 4's 3. G. boreale
 - bb. Leaves in 6's-8's.
 - c. Main leaves verticillate in 8's 1. G. Aparine
 - cc. Main leaves verticillate in 6's.... 2. G. triflorum
 - aa. Ovary glabrous.
 - d. Flowers yellow; leaves strongly revolute, with merely the midnerve showing below..... 4. G. verum
 - dd. White or greenish; leaves flat to merely narrowly revolute along the margin.
 - e. Flowers in many-flowered cymes, on peduncles usually less than 5 mm long 5. G. palustre
 - ee. Flowers in terminal cymes of (1)-2-3-(5) flowers on peduncles usually 5-10 mm long 6. G. trifidum
1. G. Aparine L. (var. echinospermum (Wallr.) Farw., var. Vaillantii (DC.) W.G.J. Koch; G. Vaillantii DC.) -- Cleavers, Goosegrass (Gratteron, Herbe collante) -- Annual with the stem leaves mostly 7-8 to a node. Very catchy from being retrorse-scabrous, forming tangles. Leaves linear-oblanceolate, mostly 2-3 cm long. Flowers white in few-flowered axillary cymules. Ovary and fruit densely covered with hooked hispid hairs. All summer. Moist wooded river banks; sometimes weedy. -- (G, Aka, NF, NS, NB)-Q-(O-Man)-S-BC, US, (SA, Eur, Afr, Oc) -- F. spurium (L.) Boivin (var. intermedium (Mér.) Briquet; G. spurium L.) -- Has smooth fruits. Local: Carlea, Waterton. -- sS-swAlta, (US, Eur).

2. G. triflorum Mx. (G. asprellum AA.) -- Trailing Cockspur -- A common forest species with rather large leaves in 6's. In small tufts, the base of the stem rather weak and the stems becoming prostrate and radiating in a rosette of stems. Herbage smooth to scabrous. Leaves largest, lanceolate, commonly 1 cm wide. Flowers in axillary cymes and terminal panicles. Ovary and fruit hispid with hooked hairs. First half of summer. Common in deciduous forests. -- G, K-Aka, L-SPM, NS-BC, US, CA, Eur.

3. G. boreale L. (G. septentrionale R. & S.) -- Crosswort -- Ovary and fruit densely hispid, but the hairs not hooked. Stems stiffly erect and smooth to slightly scabrous. Leaves in 4's, the main ones conspicuously 3-nerved with white and parallel nerves. Flowers white or nearly so, in dense terminal panicles. Early summer. Common in prairies and quite showy at flowering time. -- (G), Mack-Aka, NS, NB-BC, US, Eur.

4. GALIUM VERUM L. -- Bedstraw, Our Lady's Bedstraw (Grappelle, Herbe à la Vierge) -- The yellow flowers small but numerous and growing in rather large and dense colonies that are quite noticeable at flowering time. Leaves linear, strongly revolute, the main ones in 6's or 8's. Flowers in terminal panicles. First half of summer. Sometimes cultivated and locally naturalized at Holland and Calgary. -- NF-(SPM, NS), Q-Man, Alta-BC, (US, Eur, Afr).

5. Galium palustre L. -- A fine and weak herb, rather catchy and forming tangled masses in wet places. Stem usually slightly scabrous, glabrous at the nodes. Stem leaves linear to oblanceolate, some of them in 4's, but usually also a few in (5)-6's. Flowers numerous, in many-flowered cymes and more or less forming a terminal panicle. Pedicels usually less than 5 mm long. Corolla lobes 4, up to 1 mm long. First half of summer. Wet places. Reported for southern Manitoba and northern Alberta. -- (Y, NF-SPM, NS-NB)-Q-O-(sMan, nAlta, US, Eur, Oc).

Reports from our area (and from Yukon) need to be confirmed. The only sheet we have seen from west of Ontario was from Manitoba (DAO) and it has been revised to G. trifidum. The same may possibly apply to other reported western collections.

6. G. trifidum L. (G. labradoricum Wieg.) -- Dyer's Cleavers, Goosegrass (Tissavoyanne rouge) -- Much like the preceding and not always clearly distinct, but rather fewer-flowered. Usually somewhat scabrous. Stem leaves nearly always all in 4's. Inflorescence more diffuse, the flowers solitary or in cymes of 2-3-(4) flowers on very widely divergent pedicels, the latter commonly 5-10 mm long in fruit. Corolla lobes 3-(4), 0.5-1.5 mm long. First half of summer. Wet shaded places. -- (G, K)-Mack-(Y)-Aka, L-(NF)-SPM, NS-PEI-(NB)-Q-O-(Man)-S-(Alta)-BC, US, (Eur) -- F. halophilum (Fern. & Wieg.) Boivin -- Glabrous or nearly so and slightly fleshy. Seashores. -- L-NF-(SPM), NS-PEI-(NB)-Q, nMan, (US).

Usually subdivided into a series of microspecies which appear to us to be so many arbitrary distinctions within a mor-

phological and geographical continuum.

55. CAPRIFOLIACEAE (HONEYSUCKLE FAMILY)

Shrubs with opposite leaves, the stipules nearly always lacking. Leaves entire or commonly toothed to lobed or even compound.

- a. Leaves compound 1. Sambucus
- aa. Leaves simple.
 - b. Leaves entire.
 - c. Flowers twinned and sessile at the end of a common peduncle 5. Lonicera
 - cc. Flowers not in 2's but in small axillary clusters 3. Symphoricarpos
- bb. Leaves serrated to lobed.
 - d. Low and almost herbaceous, with leaves small, less than 2 cm long 4. Linnaea
 - dd. Quite woody and larger-leaved.
 - e. Flower rotate; stigma sessile 2. Viburnum
 - ee. Flower funelform; style rather long 6. Diervilla

1. SAMBUCUS L.

ELDER

Shrubs with opposite and pinnate leaves. Flower similar to Viburnum, but the stigma borne on a style. Fruit a 3-seeded berry.

1. S. racemosa L. var. pubens (Mx.) Watson (S. pubens Mx.) -- Catberry, Elder (Sureau rouge, Sirop rouge) -- The one common shrub with opposite and pinnate leaves. Mostly 1-3 m high. Twigs with large brownish pith. Leaflets broadly lanceolate, mostly 5. Inflorescence a panicle 3-5 cm wide, with a well defined axis, stronger than its branches. Flowers white, darkening in the herbarium. Fruits bright red and small. Early summer. Moist spots in open woods, Saskatoon eastward. -- NF, NS-cS, US -- F. xanthocarpa Cock. -- Fruit yellow. Local: Delta. -- Man, (US) -- Var. arborescens (T. & G.) Gray (var. melanocarpa (Gray) McMinn.; S. melanocarpa Gray) -- A coarser shrub, 2-6 m high. Leaves more often glabrous. Inflorescence broader. Fruit dark red and somewhat purplish. -- Aka, Walta-BC, WUS.

There is a fair amount of morphological overlap between our two varieties and a substantial proportion of the specimens could not be assigned to one variety or the other on the basis of their morphology alone. We have however interpreted all the more western references to S. pubens as applicable to var. arborescens.

There is also a fair amount of overlap in the diagnostic characters of our varieties and the eurasian var. racemosa. These are three very weak varieties at best, although they are often treated as so many species.

S. canadensis L. has been reported for our area from Shoal Lake. However all 3 collections (WIN; DAO, photo) examined

from that area have been revised to S. racemosa var. pubens.

2. VIBURNUM L.

Flower regular, rotate, small and 5-merous, the stigma sessile and the fruit reduced to a single-seeded berry (i.e.: a drupe).

- a. Leaves dentate, pinnately veined.
 - b. Finely serrate 1. V. Lentago
 - bb. Coarsely toothed 2. V. Rafinesquianum
- aa. Leaves lobed, palmately veined.
 - c. Inflorescence on a short side branchlet bearing a single pair of leaves 3. V. edule
 - cc. Flowering branchlets longer and bearing 2 pair of leaves 4. V. Opulus

1. V. Lentago L. -- Nannyberry, Wild Raisin (Alisier, Bourdaine) -- Inflorescence about 4-rayed and nearly sessile at the end of a branch which is naked below, but bears 2-4 pairs of leaves closely inserted just below the inflorescence. Leaves ovate, finely serrate, abruptly acuminate. Flowers small, white, in large corymbs. Fruit blue. Late spring. Deciduous woods, especially galerie-forests. -- NB-seS, US.

2. V. Rafinesquianum Schultes var. Rafinesquianum (V. affine Bush var. hypomalacum Blake; V. pubescens AA.) -- Shrub with opposite leaves, coarsely dentate and soft villous below. Leaves ovate. Flowering shoot elongate. Inflorescence on a long peduncle, with about 7 primary rays. Fruit nearly black. Early summer. Dry woods. -- Q-sMan, US.

The more southern var. affine (Bush) House has the leaves glabrous below or at most pubescent along the main nerves. We know it in Canada only from the Grand Bend on lake Huron.

3. V. edule (Mx.) Raf. (V. eradiatum (Oakes) House; V. pauciflorum La Pylaie) -- Pimbina, Squashberry (Pimbina, Pimbina) -- Rather inconspicuous shrub with few-flowered inflorescences of small flowers, borne on a short lateral shoot which bears only one pair of leaves and matures very few fruits, often only one. Leaves vaguely pentagonal, somewhat 3-lobed and coarsely serrate. Fruit bright red-orange. Late spring to early summer. Common forest species, especially in boggy woods. -- K-Aka, L-SPM, NS, (NB)-Q-BC, US.

Supposed to range as far as northeast Asia according to Fernald 1950, but Hultén 1949 makes no such mention and it is not included in the Flora U.R.S.S. (vol. 23).

4. V. Opulus L. var. americanum Aiton (ssp. trilobum (Marsh.) R.T. Clausen; V. trilobum Marsh.) -- Pimbina, Squashberry (Pimbina, Quatre-saisons des bois) -- Remarkable by its large inflorescences of dimorphic flowers, the peripheral ones being many times larger, sterile and very showy. Leaves deeply 3-lobed and more or less dentate. Inflorescence on a long peduncle. Flowers white, the sterile ones asymmetrical, the outer lobes being larger and about twice as long as the inner

one. Early summer. Open woods. -- NF-(SPM, NS-NB)-Q-S-(Alta-BC), US.

Typically the transatlantic var. Opulus has filiform stipules attenuate at tip; petiole bearing towards its summit one or more coarse glands, these sessile, discoid, concave and mostly 1.0-1.5 mm wide; leaves uniformly velvety-pubescent below. Our cisatlantic variety has shorter stipules, 5 mm long or less, and capitate at tip; glands smaller, capitate, stipitate, 0.2-1.0 mm wide and mostly convex; leaves glabrous to velvety below, commonly pubescent only along the nerves. However both varieties are highly variable in respect to all the characters mentioned and, undoubtedly, geography plays an important role in the determination of many specimens.

Early reports by Macoun 1884 of V. acerifolium L. and V. cassinoides L. from Saskatchewan have long since been discounted.

3. SYMPHORICARPOS DuRoi

SNOWBERRY

Flower campanulate, not twinned, regular or nearly so; style elongate. Fruit a 2-seeded berry.

- a. Stamens and style included; berry drying
white 1. S. albus
aa. Longer and more or less exserted; berry
drying purplish black 2. S. occidentalis

1. S. albus (L.) Blake (var. laevigatus (Fern.) Blake, var. pauciflorus Robbins; S. pauciflorus (Robbins) Britton; S. racemosus Mx.) -- Snowberry (Graine d'hiver) -- Shrub with nearly round, entire leaves and fat waxy-white berries drooping at the end of the branches. Forms large colonies. Glabrous or pubescent. Leaves ovate to orbicular, mostly 1-2 cm long, sometimes lobed on leading shoots. Flowers \pm 5 mm long, mostly whitish, subsessile, borne in short axillary or terminal racemes. Corolla lobes usually shorter than the tube, the style and stamens usually not exserted from the tube. Early summer. Common, especially in and around bluffs. -- sMack, Aka, NS-(PEI)-NB-BC, US.

Nearly glabrous specimens (var. laevigatus) are sporadic throughout the range, but they become the more common type west of us. They also tend to bear larger fruits, up to 1.0-1.5 cm across.

Since the days of Hooker it has been traditional to divide our material into a smaller S. albus and a larger S. occidentalis. Both are common in our area, they will often grow together; they seem to occupy about the same kind of habitats, and they intergrade to a limited extent. It might be better to treat them as varieties of a single species. The range of S. occidentalis is essentially included within that of the somewhat more widely distributed S. albus.

2. S. occidentalis Hooker -- Wolfberry (Graine de loup) --

Tending to be more vigorous and larger-flowered than the first. Leaves sometimes small, more commonly about 3-5 cm long. Inflorescences tending to be more heavily flowered. Corolla mostly 7-8 mm long and mostly pink or pinkish. Corolla lobes mostly longer than the tube. Berry \pm 6 mm wide, waxy-white like the first when fresh, but discolouring in drying. First half of summer. Mostly around Aspen bluffs. -- Mack, Q-BC, US.

4. LINNAEA L.

TWIN-FLOWER

Peduncle forked and each branch bearing a drooping flower. Corolla regular, funnel-shaped. Stamens only 4; the flower otherwise 5-merous.

1. L. borealis L. var. longiflora Torrey (var. americana (Forbes) Rehder; L. americana Forbes) -- Twinflower, Pink Bells -- Trailing shrub with forked erect peduncles, each bearing two flowers. Almost herbaceous, the stem and branches wiry. Leaves roundish, usually with 2 pairs of low teeth. Peduncle very long, with a pair of bracts at the fork. Corolla pink. Early summer. Coniferous woods. -- G, K-Aka, L-SPM, NS-BC, US -- F. candicans House -- Flowers white; a local form. -- O, Alta-BC, (US).

Var. borealis is Eurasian and Alaskan; it has shorter corolla, mostly 7-10 mm long, with a shorter tube flaring more abruptly. Not always a clear-cut distinction. Our American plants are usually further subdivided on corolla size into a larger var. longiflora west of the Rockies and a smaller and more eastern var. americana. Actually both american varieties have about the same range of variation and the difference between the two is only one of frequency, longer flowers being decidedly more frequent west of the Rockies. This may be expressed succinctly as follows:

Var. americana: flowers (8)-10-12-(15) mm long.

Var. longiflora: flowers (9)-12-15-(16) mm long.

Throughout this flora we have systematically denied taxonomic recognition to taxa with an essentially statistical basis such as the above. We have insisted on a minimum of morphological discontinuity as a sine qua non basis for the recognition of a taxon.

5. LONICERA L.

HONEYSUCKLE

Flowers borne 2 together at the end of a common peduncle. Ovaries free to fused. Corolla elongate, more or less zygomorphous, but free from its twin, even when the ovaries are fused. Leaves entire.

a. Flowers in a short terminal spike subtended by a pair of connate leaves.

b. Leaves thickish, usually sessile and

glaucous above 7. L. dioica

bb. Leaves thin, not glaucous above, the

middle ones short-petioled 8. L. hirsuta

- aa. Flowers all axillary; no connate leaves.
 c. Ovaries fused, ripening into a single berry 1. L. caerulea
 cc. Ovaries free, ripening into a pair of berries.
 d. Involucre of 4 large and showy bracts 6. L. involucrata
 dd. Involucre small relative to the ovary or fruit.
 e. Branchlets fistulose except at the nodes, the brown pith merely lining the empty core.
 f. Leaves and peduncles glabrous 3. L. tatarica
 ff. Lower leaf faces and peduncles densely pilose 2. L. Morrowii
 ee. Branchlets solid, the white pith filling the core.
 g. Leaves glabrous or lightly long pilose below 4. L. utahensis
 gg. Densely puberulent at least below 5. L. oblongifolia

1. L. caerulea L. var. villosa (Mx.) T. & G. (L. coerulea sphalm.; L. villosa (Mx) R. & S. var. Solonis (Eaton) Fern.; Xylosteum caeruleum (L.) Dum.-Cours.) -- Fly-Honeysuckle -- Ovaries fused. Leaves oblong, usually more or less villous at least below. Flowers yellow, appearing with the leaves. Ovary subtended by a pair of elongate bracts, about 5 mm long. Berry blue. Second half of spring. Common in bogs. -- seK, L-SPM, NS-Alta, US.

The eurasian var. caerulea is generally somewhat taller, it tends to be less pubescent and the corolla lobes are a bit shorter than the tube. In our variety the corolla lobes are somewhat longer than the tube.

Many other american varieties have been described but as far as we can determine they run freely into one another and are essentially sympatric, except perhaps a more western var. caurina (Fern.) Boivin which is reputed to have red berries. But we have yet to see any mature fruits of the latter.

2. L. MORROWII Gray -- Quite similar to the more common L. tatarica, but more pubescent. Twigs and peduncles densely pubescent. Leaves lightly to densely pubescent above, densely pubescent to grayish-tomentose below. Inner bracts about as long as the ovary. Flowers pubescent, white, turning orange-yellow, thus seeming to be of two different colors when the shrub is in full bloom. Berries orange to red. Late spring. Sometimes planted and apparently escaped in the coulée of the South Saskatchewan at Saskatoon. -- Q-O, S, US, Eur.

2X. L. BELLA Zabel -- Hybrid with the next and much more lightly pubescent to nearly glabrous. Flowers pink, turning yellow. Inner bracts shorter than the ovary. Sometimes planted

and exceptionally escaped or persistent: Wolseley. -- NB-O, S, US, Eur.

3. L. TATARICA L. (L. tartarica sphalm.; Xylosteum tataricum (L.) Med.) -- Honeysuckle, Twin Sisters (Chèvrefeuille) -- Glabrous throughout and commonly planted. Leaves oblong to cordate. Inner bracts less than half as long as the ovary. Flowers whitish pink, glabrous outside. Berries red or yellow. Late spring. Often planted and readily escaping, although not aggressive. -- NB-S-(Alta), US.

4. L. utahensis Watson -- Red Twinberry -- Inner bracts of the ovary minute or lacking, the outer ones present. Leaves oblong to cordate, usually ciliate and somewhat pilose below. Otherwise glabrous. Flowers cream-yellow, appearing with the leaves. Berry red. Late spring. Wet coniferous woods. -- swAlta-sBC, US.

5. L. oblongifolia (Goldie) Hooker (Xylosteum oblongifolium Goldie) -- Fly-Honeysuckle -- Leaves broadly oblanceolate. Densely puberulent throughout, including the corollas, but the leaves sometimes nearly glabrous above. Outer bracts lacking, the inner very short. Flower pale yellow, often pink tinged. Berry deep red, drying blue. Late spring. Edge of bogs and wet open woods. -- (NB)-Q-ecS, US.

6. L. involucrata (Rich.) Banks var. involucrata (Distegia involucrata (Rich.) Cock.) -- Fly-Honeysuckle, Black Twinberry -- Very showy in fruit with each pair of large deep purple berries subtended by 4 large purple bracts. Leaves ovate to obovate, often acuminate, glabrous above, pilose to glabrous below. Bracts glandular, smaller and only slightly purplish at flowering time. Corolla yellow, glandular. Early summer. Occasional in wet coniferous woods. -- K, Y-Aka, Q-BC, US.

Our typical variety is usually 2 m high or less, the herbage glabrous or somewhat pubescent, the flowers 1.0-1.5-(2.0) cm long, the stamens equalling the tube or slightly exserted. On the other hand, the californian var. Ledebourii (Esch.) Jepson is generally taller, more pubescent, the flowers 1.5-2.0 cm long and the stamens included.

7. L. dioica L. var. glaucescens (Rydb.) Butters (L. glaucescens Rydb.) -- Red Honeysuckle -- Shrub climbing by its loosely twining stems. Leaves thickish, glaucous above, the middle ones subsessile, the upper two connate into a huge saucer-shaped involucre, oblong to suborbicular, subtending the terminal spike. Inflorescence a peduncled terminal spike of verticillate flowers, with 3 pairs of sessile flowers to a verticil. Flowers longest, yellow and somewhat pinkish tinged. Berry red. Late spring and early summer. Woods. -- Mack, Q-BC, US.

Leaves villous below, glabrous above. The more eastern var. dioica has eciliate leaves glabrous on both faces.

Two more phenotypes, var. dasygyna (Rehder) Gleason and var. orientalis Gleason, are also distinguished sometimes. The typically glabrous ovary is densely glandular in var. orientalis, a variant known to occur in Canada mainly in southern Ontario, but also sporadically from southwestern Quebec to Narcisse,

Manitoba, and Saskatoon, Saskatchewan. Intermediates with sparsely or irregularly glandular ovary are more common than well characterized glandular specimens. And this glandulosity is in no way linked to the variation in leaf pubescence. From this we can conclude that var. orientalis is a sporadic variation of no particular significance. In var. dasygna the ovary is not only glandular like var. orientalis but also pubescent. It is a rather uncommon phenotype which occurs sporadically and seems to be of no more significance than var. orientalis itself.

8. L. hirsuta Eaton var. Schindleri Boivin -- Hairy Honey-suckle -- This variety is intermediate to the previous species from which it differs by its thinner leaves, not glaucous above, the middle ones with a petiole 5-10 mm long. Early summer. Rocky woods at Falcon Lake. -- Q-seMan.

As pointed out by Scoggan 1957, earlier Manitoba reports were based on misidentifications. A similar explanation probably accounts for Fernald 1950 extending the range to Saskatchewan.

Var. Schindleri var. n. foliis superne glabris vel fere glabris, ad basas et ad nervum medium tantum paullum pilosum. Type: Boivin, Laishley & Schindler 13058, Lac Falcon, Réserve Forestière Whiteshell, près d'un ruisseau de montagne, 24 juin 1959 (DAO). Paratypes: QUEBEC: J. Richard, canton Rémigny (QFA); Dutilly & Lepage 35179, rivière Nottaway (DAO); ONTARIO: Taylor, Hosie & Fitzpatrick 1192, Sault Ste. Marie (DAO); Bartlett & F. Richards 464, Mamainse Point (DAO); C.E. Garton 1831, Little Pigeon Bay (DAO).

Throughout most of their overlapping range, L. dioica and L. hirsuta are easily distinguished. In the first the leaves are glabrous on both faces, or at least above, and the twigs are glabrous. In the latter the young twigs are glandular and pubescent and the leaves are hirsute or velvety below, pilose or lightly strigose over the whole of the upper surface, except the involucreal leaves which are most often glabrous above. In L. dioica the more eastern var. dioica grades into our var. glaucescens in which the leaves are villous below, glabrous above. True, the odd specimen of var. glaucescens may be slightly pubescent above towards the base of the limb or near the mid-nerve, but such variants are easily referred to var. glaucescens by their rather thick leaves, sessile or nearly so and strongly glaucous above.

A more puzzling intermediate occurs in the northern part of the range of L. hirsuta in which var. interior Gleason, the normal phase of the species in eastern Canada, grades into a var. Schindleri fairly intermediate to L. dioica. By its large and thin leaves, dark green and little if at all glaucous, by its middle leaves borne on petioles 5-10 mm. long, this intermediate is clearly related to L. hirsuta. But its young twigs are less pubescent than in L. hirsuta, or even completely glabrous and leaves are glabrous or nearly so above, thus verging towards L. glauca.

It is a pleasure to associate the name of this new variety

with the name of a resident amateur naturalist from Falcon Lake. His kind help made it possible to locate rapidly quite a few of the highly localized plants of southeastern Manitoba.

6. DIERVILLA Duhamel

Flower rather like that of Lonicera, but each flower borne on its own peduncle.

1. D. Lonicera Miller, var. Lonicera -- Bush-Honeysuckle, Life-of-Man (Herbe bleue, Chèvrefeuille d'Acadie) -- The inferior ovary linked to the calyx by a thin neck 3-4 mm long. Low shrub. Leaves large, ovate-lanceolate, serrate, acuminate, glabrous or nearly so. Inflorescence terminal. Flower yellow, often red-tinged. First half of summer. Dry woods. -- NF-SPM, NS-ecS, US.

As early as 1833 Hooker reported this to range west to the Rockies and the report has been accepted by various later authors. It has not been confirmed by more recent collections as they are all from central Saskatchewan and eastward. A single sheet from Alberta, McVickar, L. Slave Lake, 1911 (TRT; DAO, photo) proved to be Lonicera involucrata.

The magnilacustral var. hypomalaca Fern. has the leaves abundantly pilose below.

Order 32. VERBENALES

Like the Loganiales, but the corolla more or less zygomorphic and the stamens usually reduced in number, most often to 4 or 2, and fewer than the corolla lobes. Ours are all herbs with opposite leaves.

- a. Flowers alternate to very crowded 56. Verbenaceae
- aa. Flowers obviously opposite in a lax spike 57. Phrymaceae

56. VERBENACEAE (VERVAIN FAMILY)

Calyx actinomorphic. Rather similar to the Labiatae, but the ovary not lobed and the style terminal. Corolla 5-lobed, but the stamens only 4 and dimegueth or even only 2.

1. VERBENA L. VERVAIN

Corolla barely zygomorphic.

- a. Leaves serrate.
 - b. Inflorescence lax; flowers white..... 1. V. urticifolia
 - bb. Inflorescence dense; flowers blue 2. V. hastata
- aa. Leaves deeply divided 3. V. bracteata

1. V. urticifolia L. (V. urticaefolia sphalm.) -- White Vervain, Bur-Vine -- Resembling the next, but the inflorescence more open, the spike lax and more elongate and the flowers white. Leaves narrowly ovate. Mid summer. Dry and more or less open places: Gainsborough. -- NB-sO, seS, US.

2. Verbena hastata L. -- Simpler's Joy, Iron-weed -- Stiffly erect perennial herb with a terminal panicle of dense spikes of small blue flowers. Leaves lanceolate. Fruit included in the calyx. Mid to late summer. Wet places, usually near shores, west to Wadena and Roche-Percée. -- NS, NB-seS, BC, US.

A sight record for Alberta by Groh 1949 has never been confirmed and is discounted as improbable.

3. V. bracteata Lag. & Rodr. (V. bracteosa Mx.) -- Sprawling annual with heavily bracted terminal spikes. Hirsute. Stem leaves deeply trilobed to pinnatifid, the lobes serrate. Spikes dense. Bracts overtopping the flowers and fruits. Flower blue. All summer. Light or disturbed soils, often weedy. -- O-BC, US, (CA).

57. PHRYMACEAE (LOPSEED FAMILY)

A single species of a rather unusual type and doubtful position. Calyx zygomorphic, with 5 lobes, the lower two minute, the upper 3 prolonged into subulate hooks.

1. PHRYMA L. LOPSEED

A square-stemmed herb with opposite leaves and bilabiate flower, rather resembling a Labiate, but the ovary unilocular and one-seeded, maturing into a single achene.

1. Phryma leptostachya L. -- Lopseed -- Long stiff spikes of flowers that are at first strictly erect, becoming stiffly spreading at anthesis and maturing into closely pendant, catchy fruits. Leaves few, large and thin, broadly ovate, coarsely and irregularly serrate, pubescent. First half of summer. Alluvial woods: Pembina Hills, Portage. -- NB-Man, US, (CA, Eur).

The Far Eastern plants are supposed to be slightly different, var. oblongifolia (Koidz.) Honda (= var. asiatica Hara), a point we have not had the opportunity to check.

The Rutaceae of the order Rutales are not definitely represented in our area. Ruta graveolens L. was reported from Twin Butte, Alta., in the Prov. B.C. Rep. Prov. Mus. 1941: Cll. 1942, and was repeated by Groh 1944 and 1950, but we have not yet checked this point and have no idea if the plant was correctly identified and represented cultivated or escaped material.

Order 33. SAPINDALES

Stamens not on the corolla, but rather perigynous. Shrubs and trees mostly with the leaves compound or sometimes palmately lobed.

- a. Leaves opposite 58. Aceraceae
 aa. Leaves alternate 59. Anacardiaceae

58. ACERACEAE (MAPLE FAMILY)

Flowers dioecious with the petals minute and free or lacking. Carpels 2. Leaves opposite.

1. ACER L.

MAPLE

Fruit a pair of asymmetrical samaras, each like a half propeller.

a. Leaf compound 4. A. Negundo
 aa. Leaf simple.

b. Palmatifid, the lobes rhomboid 3. A. saccharinum
 bb. Palmately lobed, the lobes deltoid to triangular.

c. Inflorescence a racemose panicle.... 1. A. spicatum
 cc. Inflorescence a corymb 2. A. glabrum

1. A. spicatum Lam. -- Whitewood, White Maple (Plaine batarde, Fouèreux) -- Tall shrub with palmately lobed leaves. The lobes 5, those of the lower pair often obscure. Margin serrate. Twigs grayish-pubescent. Leaves pubescent below. Early summer. Aspen-Birch forests. -- (L)-NF-SPM, NS-ecS, US.

2. A. glabrum Torrey var. Douglasii (Hooker) Dippel -- Mountain Maple -- Similar but glabrous and the inflorescence corymbose. Late spring. Coniferous forests at the lower altitudes. -- Aka, swAlta-BC, US.

Var. glabrum from the southern Rockies has smaller leaves, 6 cm wide or less, and more deeply lobed, palmatifid leaves.

3. A. SACCHARINUM L. -- Silver-Maple, Soft Maple (Plaine blanche, Erable blanc) -- Tree with palmatifid leaves. Leaves strongly glaucous below. Lobes rhomboid, broadest near the middle, narrower at base, irregularly and coarsely serrate. Flowers in glomerules. Very early spring. Often planted and exceptionally escaped: Portage, Moose Jaw. -- NB-S, US.

Planted here and there as a shade tree, susceptible of escaping to river shores. Despite many previous Manitoba reports, this tree is not native to the province and every time we tried to follow a lead we always ended up with cultivated trees. In 1951 we came across a single young shoot on the shores of the Assiniboine at Portage-La-Prairie, but in 1959 it had disappeared. The following year we found it to be naturalized in the extensive galerie-forest of the Moose Jaw Creek at Moose Jaw.

4. A. Negundo L. var. Negundo -- Sugar-Maple, Box-Elder, Manitoba Maple (Erable, Erable à Giguère) -- A tree with leaf-green and glabrous twigs. Leaves compound, most commonly with 3 leaflets. The latter ovate to lanceolate, entire to irregularly few-lobed. Inflorescence a panicle. Ovary red, becoming green before the fruit is half grown, the wing becoming green before the fruit is half grown, the blade of the wing becoming green before its dorsal nerve. First half of spring. Galerie-forests; commonly planted, as are also its varieties. -- NS-sMan, US. -- F. sanguineum L. Martin -- Young fruit at first purple, the rib of the wing turning green around mid June, the blade remaining purple for another 2-3 weeks. Local: Brandon, Letellier. -- O-Man -- Var. violaceum (Kirchner) Jaeger -- Like the first, but the twigs strongly glaucous. Escaped in Alberta, indigenous further east. -- Mack, NS, NB-sS-nAlta, US -- F. Dorei

Boivin -- Young fruits purple-red, not becoming green until mid-summer, the dorsal nerve being first to turn green. Occasional.
 -- Q-sMan, US -- Var. interius (Britton) Sarg. (Negundo interius (Britton) Rydb.) -- Twigs finely and densely grayish-puberulent.
 -- Mack, (O) - Man-Alta, US -- F. Loeveorum Boivin (f. sanguineum AA.) -- Twigs as in var. interius, fruits as in var. Dorei -- PEI, Man-S.

Var. interius occurs as a native from southeastern Alberta to Lake Superior, naturalized further north and east. Eastern reports for the other varieties are also based on naturalized plants.

59. ANACARDIACEAE (CASHEW FAMILY)

Petals present, 5, free. Carpel solitary. Leaves alternate.

1. RHUS L.

SUMACH

Shrubs with compound leaves. Fruit a drupe.

- a. Leaves pinnate 1. R. glabra
- aa. Leaves trifoliate.
 - b. Leaflets sessile 2. R. aromatica
 - bb. Leaflets petioled 3. R. radicans

1. R. glabra L. (var. borealis AA.) -- Sumac, White Sumac (Vinaigrier) -- Shrub with long, pinnate leaves. Glabrous. Leaflets numerous, lanceolate, opposite, serrate. Twigs often glaucous. Inflorescence terminal, a large panicle of green flowers or reds drupes. Mid summer. Dry and open woods on the Coteau de Prairie and in southeastern Manitoba. -- swQ-ecS, BC, US, (CA).

2. R. aromatica Aiton var. trilobata (Nutt.) Gray (R. canadensis Marsh. var. trilobata (Nutt.) Gray; R. trilobata Nutt.) -- Squawbush, Skunkbush -- Trifoliate-leaved shrub with terminal clusters of reddish drupes. Leaflets irregularly lobed or toothed, commonly trilobed, the terminal leaflet abruptly long cuneate at base. Fruit minutely glandular-viscous. Early spring. River flats and steep banks of coulées. -- S-Alta, US, (CA).

In the more eastern var. aromatica the terminal leaflet is 4-7 cm long and bears 7-13 teeth while the bracts are glabrous dorsally in the upper half. In our var. trilobata the leaflets are smaller and cut into only 3-5-(7) teeth while the bracts are uniformly densely pubescent dorsally. The difference in the size of the leaflets may be only a climatic reaction, if we are to judge by a Saunders collection of material cultivated at Ottawa (DAO) and originating from Lethbridge.

3. R. radicans L. var. Rydbergii (Small) Rehder (R. Toxicodendron AA.; Toxicodendron desertorum Lunell; T. Rydbergii (Small) Greene) -- Poison-Ivy, Poison-Oak (Herbe à puce, Bois de chien) -- Rather inconspicuous low shrub with 3 large leaflets on a long erect petiole. Leaflets ovate, entire to coar-

sely toothed. Flowers in a small panicle between the leaf bases. Fruit a small pale green drupe, glabrous. Late spring. Common, abundant and almost ubiquitous in forests, shores and sand dunes. -- NS-BC, US.

The slightest contact with any part of this shrub may cause a very itchy and painful dermatite that can easily degenerate into a hospital case. In some parts of its range this shrub is very virulent, but in our region it seems to be almost innocuous, perhaps because of the drier or cooler climate.

Our variety is a low shrub and strictly non-climbing. The typical phase occurs in southwestern Quebec and southern Ontario and southward; it will climb up to the nearest tree by means of adventive rootlets in the manner of Vitis.

ERRATA GRAVIORA

- Page 5, line 11 from bottom. Instead of: nichr
read: niche
- Page 10, last line. Instead of: 0.05
read: 0.5
- Page 15, line 19 from bottom. Instead of: mm
read: m
- Page 22, line 20 from bottom. Instead of: aqualinum
read: aquilinum
- Page 22, line 10 from bottom. Instead of: mm
read: m
- Page 26, line 22. Instead of: cm
read: dm
- Page 30, line 5 from bottom. Instead of: virgianum
read: virginianum
- Page 38, line 8. Instead of: mm
read: m
- Page 70, line 4 from bottom. Insert the single letter
n so the sentence will read in part: a
series of n generation segregates.

ADDITIONS AND CORRECTIONS

The following were accidentally omitted or came to our attention after the corresponding text had been given its final form for printing.

Page 62 -- A report of typical Potentilla flabellifolia from Alberta by Hitchcock 1961 was repeated by Boivin 1966. It could not be substantiated by specimens at NY or WTU and may represent only a lapsus calami.

Page 74 -- The range of Thermopsis rhombifolia should probably be amended to eliminate BC., as the reports (Ulke 1934, Eastham 1947, Taylor 1966 and Boivin 1966) and specimens from that province are likely to represent errors of identification or mislabels or cultivated plants. None has ever been confirmed and most are far out of range and by as much as 400 miles. The Field report carries the unlikely habitat of "open woods" and there was no specimen under that name in 1964 at TRT where Ulke's herbarium is preserved; the original sheet may have been revised since. The Summerland specimen (UBC; DAO, photo) is dated 1935 and carries no habitat data; it is impossible to eliminate the possibility of its being cultivated material. Further if it were native it would be surprising that such a showy plant would have escaped the attention of the many visiting botanists and the numerous resident research botanists at Summerland. The Goat Mt., Erikson (V; DAO, photo), collection carries no habitat data, but the many sheets at UBC from the same area by the same collector are all annotated "garden grown". Another sheet at UBC (photo at DAO) was revised in 1964 from Lupinus nootkatensis to Thermopsis montana Nutt. and appears to be the basis of the inclusion of the latter in the list by Taylor 1966. We have revised it to T. rhombifolia. It is a mere fragment of inflorescence labelled C.V. Copley, Ingenika River, soil gravelly bench, very wet, springy, lat. 56, 46; long. 126, 25, June 18-26, 1914 (UBC; DAO, photo). The habitat is wrong and the specimen is out of range by some 10 degrees of longitude. Thus we are left without convincing vouchers for either species of Thermopsis from British Columbia.

Page 79 -- Add the following which keys out to M. wolgica.
5. MELILOTUS ELEGANS Salzm. -- Legume strongly ridged transversally. Glabrous or nearly so. Flowers yellow, about 4 mm long. Pedicel about 2 mm long. Calyx slightly shorter, 1.5-2.0 mm long, its lobes triangular. Legume \pm 3 mm long, obovoid, glabrous, turning black. Summer. Rarely escaped to waste places; Brandon. -- sMan, (Eur, Afr).

Like M. indica and M. wolgica, a casual escape from experimental plantings.

Page 107 -- Add after Populus balsamifera.

4 X. P. Jackie Sarg. (P. manitobensis Dode) -- Hybrid with P. deltoides. The leaves not so white below, more coarsely serrate, deltoid-cordate and caudate. Local, especially in sand dunes. -- swQ-Alta, (US).

Our western plants could be treated as a nothomorph of the

eastern type, but the morphological distinction to be established has eluded us.

Page 141 -- The range of Mirabilis hirsuta var. hirsuta should be extended to include B.C. as it was collected at Keremeos in 1963. The species is native in our area, but occurs east and west of us only as a railway introduction.

Page 173 -- Arceuthobium americanum has been reported from White Otter Lake in western Ontario by J. Kuijt, Nat. Mus. Bull. 186: 138. 1963 quoting an earlier (1956) report by Horde & Quirke. The corresponding voucher, McPhee & Miller 4240, White Otter Lake, on Pinus banksiana, 1-IX-1955 (Sault Ste. Marie Forestry; DAO, photo), was in 1967 revised by Kuijt to A. pusillum. We concur.

Page 173 -- The range of Arceuthobium pusillum should be extended westward to the region of Hudson Bay Junction in east-central Saskatchewan according to J. Kuijt (see above) in the same paper. The relevant voucher specimen (not seen) is reportedly preserved at UBC.

Page 173 -- The report by Boivin 1966 of Alaska for Arceuthobium Douglasii Eng. was a lapsus calami for Alberta and was based on the earlier report by Hitchcock 1964. However A. Douglasii is restricted in Canada to the valleys of the Kootenay and the Okanagan and, pending checking of the relevant specimens, we are withholding judgement on its presence or absence in Alberta.

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ADDITIONAL NOTES ON THE GENUS VERBENA. V

Harold N. Moldenke

VERBENA CAROLINA f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 15: 495. 1968.

Additional citations: MEXICO: Sinaloa: H. S. Gentry 6212 (Du--319703).

VERBENA CILIATA Benth.

Additional & emended bibliography: A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 337 (1878) and ed. 2, 2 (1): 337. 1886; Martin & Bradley, Seed Ident. Man. 194. 1961; Moldenke, Phytologia 14: 280--281. 1967; Moldenke, Résumé Suppl. 15: 2, 3, & 15. 1967.

Rzedowski says that his no. 3051 had "flores moradas", while on Mick & Roe 15 the corollas were "violet", Moldenke & Moldenke 2160 "light red-violet", Moldenke & Moldenke 2192 & 2193 "red-magenta", and on R. C. West G.14c "purple".

Recent collectors have found this plant growing on rocky slopes in grasslands and on deserts with extensive desert pavement and Agave, Aloë, and cactus common. The Andrew Moldenkes describe the plant as "an abundant roadside ground cover" in Tlaxcala and an "extremely abundant prostrate ground cover plant on both sides of the Tlaxcala-Veracruz border" and "a roadside weed" in the Federal District of Mexico. They report that on their no. 2155 the mature flowers had "nearly bright red-violet" corollas, while no. 2154 was a color deviant, from the same locality, with its corollas "light-blue with violet center". They point out that, in their opinion, this is not a significant difference.

Material has been misidentified and distributed in herbaria under the name V. erinoides Willd. On the other hand, the DeWolf 791, distributed as V. ciliata, is actually V. bipinnatifida Nutt., Tharp 49-1119 is V. ciliata var. longidentata Perry, H. Gentry 5-94 and J. Reverchon s.n. [Curtiss 1963**] are V. pumila Rydb., and Nelson & Nelson 4983 is V. wrightii A. Gray.

Additional citations: MEXICO: Coahuila: Mick & Roe 15 (Ws). Durango: A. R. Moldenke 1577 (Rf), 1610 (Ac). Federal District: Moldenke & Moldenke 2160 (Ac). Guanajuato: A. R. Moldenke 1809 (Rf), 1814 (Rf); Moldenke & Moldenke 2154 (Rf), 2155 (Rf). Hidalgo: Quintero 349 (Du--510515); R. C. West B.11 (Ac), G.14c (Ws), J.24 (Ac). Jalisco: A. R. Moldenke 1820 (Ac); Moldenke & Moldenke 2150 (Rf). Michoacán: A. R. Moldenke 1669 (Ac), 1749 (Ac). Nayarit: A. R. Moldenke 1644 (Ac). Nuevo León: Edw. Palmer 1045 (Ms--30786). Oaxaca: B. Hallberg 1064 (Mi). San Luis Potosí: J. Rzedowski 3051 (Du--510433). Tlaxcala: Moldenke & Moldenke 2193 (Rf). Veracruz: Moldenke & Moldenke 2192 (Ac). Zacatecas:

Moldenke & Moldenke 2143 (Ac). CULTIVATED: Germany: Herb. F. J. Young s.n. (Ws).

VERBENA CILIATA var. LONGIDENTATA Perry

Additional bibliography: Moldenke, Résumé Suppl. 15: 2 & 3. 1967; Moldenke, Phytologia 14: 281. 1967.

McCart found this plant growing in black calcareous clay in Texas.

Additional citations: TEXAS: Nueces Co.: A. A. Heller 1385 (Ms--30756). Parker Co.: McCart 8964 (Du--511963). Travis Co.: Tharp 49-1118 (Ms--34282). MEXICO: Michoacán: A. R. Moldenke 1695 (Rf).

VERBENA CILIATA var. PUBERA (Greene) Perry

Additional bibliography: Moldenke, Phytologia 14: 281. 1967.

Additional citations: NEW MEXICO: Dona Ana Co.: I. L. Wiggins 13392 (Du--450420).

VERBENA CLAVATA Ruiz & Pav.

Additional bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 221 (1817) and ed. quart., 2: 273. 1818; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Moldenke, Phytologia 14: 281. 1967.

It should be noted that the H.B.K. reference dates given above have been authenticated by Barnhart (1902).

VERBENA CLOVERAE Moldenke

Additional bibliography: Moldenke, Phytologia 13: 246--248. 1966; Shinn, Univ. Kans. Sci. Bull. 46: 891. 1967.

Shinn (1967) reports that the bee, Calliopsis (Verbenapis) micheneri Shinn, is known only from the part of Texas where this species of Verbena is native. Barrera found V. cloverae growing in fine sandy silt in Zapata County, Texas. The Tharp & York 27, previously cited by me as typical V. cloverae, is actually f. alba Lundell.

Additional citations: TEXAS: Kleberg Co.: M. C. Johnston 53253.7 (Ms--44071). Zapata Co.: E. Barrera 5 (Du--511959).

VERBENA CLOVERAE f. ALBA Lundell

Additional bibliography: Moldenke, Phytologia 9: 201. 1963.

Additional citations: TEXAS: Dimmit Co.: Tharp & York 27 (Au--193914).

VERBENA COCHABAMBENSIS Moldenke

Additional bibliography: A. María, Pl. Valle Cochabamb. 2: 42. 1966; Moldenke, Phytologia 14: 281. 1967.

VERBENA CORYMBOSA Ruiz & Pav.

Additional synonymy: Verbena corimbosa Ruiz & Pav. apud J. E. Gonzalez, Revist. Cientif. Mex. 1 (14): 13, sphalm. 1881.

Additional bibliography: J. E. Gonzalez, *Revist. Cientif. Mex.* 1 (14): 13. 1881; H. C. Comber, *Gard. Chron.*, ser. 3, 92: 373. 1932; Moldenke, *Phytologia* 14: 281. 1967.

Recent collectors have found this plant growing by streams. Gonzalez (1881) records the common name "alfombrilla" for this species. The Rambo, *Herb. Anchieta* 51505, distributed as V. corymbosa, is actually V. lobata Vell.

Additional citations: BRAZIL: Rio Grande do Sul: Sehnem 5158 (B).

VERBENA CRITHMIFOLIA Gill. & Hook.

Additional & emended bibliography: Hieron., *Bol. Acad. Nac. Cienc. Córdoba* 4: [Sert. Sanjuan.] 68 (1881) and 4: 405 & 409. 1881; Lorentz & Niederlein, *Bot. Exped. Rio Negro* 264. 1881; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1178. 1895; H. C. Comber, *Gard. Chron.*, ser. 3, 92: 373. 1932; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 2: 1178 (1946) and pr. 3, 2: 1178. 1960; Moldenke, *Phytologia* 14: 281. 1967.

Additional citations: ARGENTINA: Mendoza: Paci 514 (Ws).

VERBENA CUNEIFOLIA Ruiz & Pav.

Additional & emended bibliography: J. Gómez, *Biota* 6: 107, 109, 115, & 119. 1966; Moldenke, *Phytologia* 14: 281 & 282. 1967.

Gómez (1966) records this species from Ancash, Peru.

xVERBENA DEAMII Moldenke

Additional synonymy: xVerbena dodgei Boivin, *Naturaliste Can.* 93: 429 & 437. 1966.

Additional & emended bibliography: Hartley, *Univ. Iowa Stud. Nat. Hist.* 21: 144. 1966; Gaiser & Moore, *Surv. Vasc. Pl. Lambton Co.* 100--101. 1966; Moldenke, *Phytologia* 13: 247. 1966; Boivin, *Naturaliste Can.* 93: 429 & 437. 1966; Moldenke, *Résumé Suppl.* 15: 1. 1967.

Boivin (1966) proposes the name, xVerbena dodgei Boivin, for the hybrid between V. bracteata Lag. & Rodr. and V. hastata L. and discards my earlier binomial because it was unaccompanied by a Latin description when proposed. He describes the hybrid as follows: "habitus brevius et modo decumbens V. bracteatae, sed spicis numerosis, gracilibus bracteis brevibus modo V. hastatae. Folia grosse dentata, nec lobata sed oblongo lanceolata et minora 2--6 cm long., ad basas in petiolum brevem attenuata modo V. bracteatae. Bractee lineares, praecipue 3--5 mm long." As type he designates C. K. Dodge 62078 -- in whose honor it is named -- from sandy soil, Point Edward, Lambton County, Ontario, collected on August 20, 1903, and deposited in the National Herbarium of Canada.

According to Gaiser & Moore (1966) this hybrid was listed by Dodge from Point Edward. Both parental species, but not the hybrid, are found there now. I have not seen the 62078 collection, but all the other specimens collected by Dodge at Point Edward and

identified by him as this hybrid have proved to be xV. perriana Moldenke instead. As yet I have not seen xV. deamii from Canada and so, until I can see the type material, I shall have to regard the status of xV. dodgei as doubtfully synonymous.

Hartley (1966) found xV. deamii "rare in dry sandy soil" in Allamakee County, Iowa.

Additional citations: ILLINOIS: Henderson Co.: H. N. Patterson s.n. [Oquawka, July] (Ms--30838).

VERBENA DELTICOLA Small

Additional bibliography: Moldenke, Phytologia 14: 281. 1967.

The corollas are described as "reddish-purple" on S. S. White 1425.

Additional citations: TEXAS: Cameron Co.: Davis & Johnston 53253.21 (Ms--44072). MEXICO: Nuevo León: Edw. Palmer 1051 (Ms--30751); S. S. White 1425 (Mi).

VERBENA DISSECTA Willd.

Additional bibliography: Meyer & Weyrauch, Guia Excurs. Biol. Tucum. 64 & 123. 1966; Moldenke, Phytologia 14: 281--282. 1967.

The O. Camargo 2022, Herb. Anchieta 48478 & 62124, and Sehnem 2128, distributed as V. dissecta and so cited by Rambo (1965), are actually V. selloi Spreng., while Rambo, Herb. Anchieta 51652 is V. tenuisecta Briq.

Additional citations: ARGENTINA: Catamarca: Brizuela 375 (Ws). Córdoba: Villafañe 120 (Du--330709). Santiago del Estero: Ruiz Huidobro 3137 (Ms--34283).

VERBENA DISSECTA f. ALBA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 282. 1967.

The Herter 1805 [Herb. Herter 96556] cited by me in a previous installment of these notes is actually V. pulchella Sweet.

VERBENA EHRENBURGIANA Schau.

Additional bibliography: Moldenke, Phytologia 13: 194. 1966.

Additional citations: MEXICO: Nuevo León: Pringle 1948 (Ms--30787).

VERBENA ELEGANS H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 220--221. 1817.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 220--221 (1817) and ed. quart., 2: 273. 1818; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; L. H. Bailey, Man. Cult. Pl., ed. 2, 840, 841, & 1113. 1949; Moldenke, Phytologia 14: 282. 1967; Moldenke, Résumé Suppl. 15: 3. 1967.

It should be noted that the H.B.K. reference dates given above have been authenticated by Barnhart (1902).

Additional citations: MEXICO: Hidalgo: Pringle 6908 (Ms--30788). San Luis Potosí: D. B. Ward 5804 (Ac).

VERBENA ELEGANS var. ASPERATA Perry

Additional bibliography: L. H. Bailey, Man. Cult. Pl., ed. 2, 841 & 1113. 1949; Moldenke, Phytologia 13: 248. 1966; Moldenke, Résumé Suppl. 15: 3. 1967.

The corollas are described as "magenta" on Stanford, Lauber, & Taylor 2486 and as "purple" on Breedlove 14418.

Verbena elegans var. asperata is actually very closely related to and often somewhat difficult to distinguish from forms of the northern V. canadensis (L.) Britton. In V. canadensis, however, the plants are normally only somewhat and quite irregularly hirsute, the spike elongate conspicuously in age, the bractlets are slightly shorter than or equal to the calyx they subtend, the calyx is 10--13 mm. long, with weak and irregular pubescence, and the calyx-teeth are 2--3 mm. long. In V. elegans var. asperata, on the other hand, the plants are always densely hispid-hirsute, the spikes are compact even at maturity, the bractlets are 1/2 to 2/3 as long as the calyx they subtend, the calyx is 8--10 mm. long, with uniform stiff pubescence, and the calyx-teeth are rarely over 2 mm. long.

Additional citations: MEXICO: Chiapas: Breedlove 14418 (Ac). Coahuila: Edw. Palmer 1052 (Ms--30828). Tamaulipas: Stanford, Lauber, & Taylor 2486 (Du--366260). CULTIVATED: Germany: Wagenitz s.n. [Mus. Bot. Berol. Gartenherb. W.384] (Rf).

xVERBENA ENGELMANNII Moldenke

Additional & emended bibliography: Gaiser & Moore, Surv. Vasc. Pl. Lambton Co. 100. 1966; Boivin, Naturaliste Can. 93: 429. 1966; Hartley, Univ. Iowa Stud. Nat. Hist. 21: 162. 1966; Moldenke, Phytologia 14: 282. 1967; Moldenke, Résumé Suppl. 15: 1 & 2. 1967.

The Ewan 19083, distributed as this hybrid, is actually V. montevidensis Spreng., while F. R. Saint John s.n. [11 Sept. 1930] is V. urticifolia L.

Additional citations: NEW HAMPSHIRE: Cheshire Co.: W. Deane s.n. [Aug. 10, 1890] (Ms--80929, Ms--80930). ILLINOIS: Tazewell Co.: V. H. Chase 3230 (Du--367442). MISSOURI: Saint Louis: Eggert s.n. [De Hodiament Av., 4 Aug. 1875] (Ms--30835).

VERBENA EPHEDROIDES Cham.

Additional & emended bibliography: Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: 408. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1178 (1895), pr. 2, 2: 1178 (1946), and pr. 3, 2: 1178. 1960; Moldenke, Phytologia 13: 195. 1966.

VERBENA FILICAULIS Schau.

Additional bibliography: Moldenke, Phytologia 13: 195--196. 1966.

O. Camargo 3118 is anomalous in that the plant has not turned black in drying!

Additional citations: BRAZIL: Paraná: Hatschbach 14192 (Rf).
Rio Grande do Sul: O. Camargo 3118 [Herb. Anchieta 62898] (B);
Rambo, Herb. Anchieta 54571 (B), 54642 (B); Sehnm 5131 (B).

VERBENA FLAVA Gill. & Hook.

Additional bibliography: H. C. Comber, Gard. Chron., ser. 3,
92: 391. 1932; Moldenke, Phytologia 14: 283. 1967.

VERBENA GLABRATA H.B.K., Nov. Gen. & Pl. Pl., ed. folio, 2: 223--
224. 1817 [not V. glabrata R. A. Phil., 1870].

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl.,
ed. folio, 2: 223--224 (1817) and ed. quart., 2: 276--277. 1818;
Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Moldenke, Phytolo-
gia 14: 283. 1967; Moldenke, Résumé Suppl. 15: 4. 1967.

It should be noted here that the H.B.K. reference dates given
above have been authenticated by Barnhart (1902). The Schimpff
132 cited by me a V. glabrata in a previous installment of these
notes, proves to be V. litoralis H.B.K. instead.

Additional citations: ECUADOR: Pichincha: Ugent & Ugent 5568
(Ac, Ws).

VERBENA GLABRATA var. TENUISPICATA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 283. 1967;
Moldenke, Résumé Suppl. 15: 4. 1967.

This plant has been found in flower and fruit in April.

Additional citations: GALAPAGOS ISLANDS: Albemarle: J. T.
Howell 9007 (Gg--462945); A. Stewart 3317 (Bi--isotype, W--
921527--isotype).

VERBENA GOODINGII Briq.

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj.
Index 15: 14361. 1958; Munz, Calif. Desert Wildfls. 47, pl. 62.
1962; Holmgren & Reveal, U. S. Forest Serv. Res. Paper INT.32:
[Checklist Vasc. Fl. Intermont. Reg.] 91. 1966; Moldenke, Phyto-
logia 13: 248. 1966; Moldenke, Résumé Suppl. 15: 2. 1967.

Additional illustrations: Munz, Calif. Desert Wildfls. pl.
62 [in color]. 1962.

Recent collectors have found this species growing in granite
ravines with Rhamnus californica and Quercus turbinella, on the
crest of a ridge in a grove of Pinus ponderosa and Quercus gam-
belii, in granite alluvium on gently south-sloping "banada", a-
long a dry stream-bed which has occasional seep areas, on volcan-
ic slopes, in areas sparsely covered by Adenostoma fasciculatum,
among boulders along creeks, and on rocky slopes in Juniperus-
Artemisia tridentata association. Gould describes the plant as
much-branched from a thick rootstock. Demaree speaks of this
species as forming "wonderful clumps" and as common in low sandy
areas on dry ridges in Mohave County, Arizona.

The corollas are described as "blue" on Breedlove 4202, "lav-
ender-blue" on C. B. Wolf 7021 & 9680, "blue-violet" on F. W.

Gould 1730, "lavender" on Broder 648 & 704, "light-lavender" on Broder 508a, "pink" on Broder 811, "lilac-blue" on Broder 348, "purple" on Breedlove 1130, and "light-purple" on H. W. Graham 7-15-9. Benson found the plant growing at 365 m. altitude. Holmgren & Reveal (1966) misspell the abbreviation for Briquet's name "Brig." Munz (1962) says that the species is found from the eastern Mohave Desert to Utah and Arizona in dry canyons and on slopes at 4000 to 6500 feet altitudes, blooming from April to June.

Material has been misidentified and distributed in herbaria under the name V. ciliata var. ciliata. On the other hand, the H. W. Graham 8-9-5 and J. J. Thornber s.n. [April 24, 1903], distributed as typical V. gooddingii, are actually var. nepetifolia Tidestr., I. L. Wiggins 15074 and Wiggins & Thomas 187 are V. setacea Perry, and Nelson & Nelson 5014 and C. L. Porter 3016 are V. wrightii A. Gray.

Additional citations: UTAH: Washington Co.: F. W. Gould 1730 (Du--324987). NEW MEXICO: Guadalupe Co.: Snell s.n. [May 4, 1963] (Ws). ARIZONA: Coconino Co.: A. A. Heller 15794 (Du--312032). Maricopa Co.: L. Benson 10018 (Du--326795). Mohave Co.: Breedlove 1130 (Du--489070); Demaree 38945 (Rf), 40105 (Ac), 44480 (Rf); Snell s.n. [April 27, 1963] (Ws). Pima Co.: H. W. Graham 7-15-9 (Du--331448). Pinal Co.: J. J. Thornber s.n. [Oracle, May 28, 1905] (Du--326820). Yavapai Co.: Demaree 42494 (Du--447061); N. H. Russell 11233 (Ws); Snell s.n. [May 3, 1963] (Ws). CALIFORNIA: San Bernardino Co.: C. B. Wolf 7021 (Du--339505), 9680 (Du--339324). County undetermined: Edw. Palmer 339 [S. E. Cal.] (Ms--30785). MEXICO: Baja California: Breedlove 4202 (Du--497215); Broder 348 (Du--500789), 508a (Du--500790), 648 (Du--500791), 704 (Du--500792), 811 (Du--500793); Wiggins & Wiggins 16073 (Du--506566).

VERBENA GOODDINGII var. NEPETIFOLIA Tidestr.

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Holmgren & Reveal, U. S. Forest Surv. Res. Paper INT.32: [Checklist Vasc. Fl. Intermont. Reg.] 91. 1966; Moldenke, Phytologia 13: 248. 1966.

Recent collectors have found this plant growing with Lycium and Prosopis in a gravelly shallow arroyo and in a wash associated with Euphorbia tomentulosa, Idria columnaris, Ferocactus sp., Larrea divaricata, Pachycereus pringlei, Acacia greggii, Agave sp., and Opuntia sp. Thornber refers to it as a "handsome species". The flowers are described as "pale-pink" on Carter, Alexander, & Kellogg 1885.

Additional citations: ARIZONA: Pima Co.: H. W. Graham 8-9-5 (Du--321525); J. J. Thornber s.n. [April 24, 1903] (Du--325115).

MEXICO: Baja California: Carter, Alexander, & Kellogg 1885 (Du--349168); Hastings & Turner 63-192 (Du--501209). Sonora: A. R. Moldenke 1529 (Rf), 1541 (Ac), 1542 (Ac), 1543 (Rf); I. L. Wiggins 11775 (Du--346430).

VERBENA GRACILESCENS (Cham.) Herter

Emended synonymy: Verbena gracilescens Cham. ex Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: 405. 1881.

Additional bibliography: Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: 405. 1881; Lorentz & Niederlein, Bot. Exped. Rio Negro 264. 1881; Mayer & Weyrauch, Guia Excurs. Biol. Tucum. 64 & 123. 1966; Moldenke, Phytologia 14: 283. 1967.

The corollas on Venturi 2300 are described as "clear-violet". The Pivetta 966 and Herb. Anchieta 59154, distributed as V. gracilescens and so cited by Rambo (1965), are actually V. montevidensis Spreng.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo, Herb. Anchieta 30975 (B). BOLIVIA: Province undetermined: M. Bang 1058 (Ws). ARGENTINA: Santa Fé: Ruiz Huidobro 3080 (Du--330708, Ms--34286). Tucumán: Venturi 2300 (Du--372484).

VERBENA GRACILIS Desf.

Additional bibliography: Robinson & Greenm., Am. Journ. Sci. 150 [ser. 3, 50]: 143. 1895; Moldenke, Phytologia 13: 197. 1966.

Breedlove found this plant growing on a road bank in San Luis Potosí. The Andrew Moldenkes describe the plant as a "prostrate alpine herb" in Zacatecas and as growing on road shoulders in Puebla. The corollas are described as "blue" on Breedlove 15478.

This species is said by Robinson & Greenman (1895) to resemble V. grisea Robinson & Greenm. in habit, differing in the characters of pubescence and foliage.

Additional citations: ARIZONA: Pima Co.: Pringle s.n. [Gardner's Spring, June 25, 1882] (Ms--30782). Santa Cruz Co.: A. R. Moldenke 1868 (Rf). MEXICO: Durango: A. R. Moldenke 1574 (Ac). Federal District: Pringle 6539 (Ms--30814). Guanajuato: A. R. Moldenke 1810 (Rf). Jalisco: A. R. Moldenke 1819 (Ac). Puebla: Moldenke & Moldenke 2316 (Rf). San Luis Potosí: Breedlove 15478 (Ac). Zacatecas: A. R. Moldenke 1594 (Rf); Moldenke & Moldenke 2140 (Ac).

VERBENA GRISEA Robinson & Greenm.

Additional & emended bibliography: Robinson & Greenm., Am. Journ. Sci. 150 [ser. 3, 50]: 142--143 & 147. 1895; B. L. Robinson, Proc. Am. Acad. 38: 197. 1902; Moldenke, Phytologia 14: 283--284. 1967.

The surname of the collector of the type of this species is "Baur", not "Bauer" as stated by me in previous installments of these notes. It is cited from Albemarle Island by Robinson & Greenman on page 147 of their 1895 work, but this was a typograph-

ic error, as pointed out by Robinson in 1902.

VERBENA HALEI Small

Additional bibliography: Hutchins, Sida 3: 182. 1967; Moldenke, Phytologia 14: 284. 1967; Moldenke, Résumé Suppl. 15: 2. 1967.

Demaree describes this species as "common on dry ridges" in Cass County, Texas, while Dominguez M. & McCart found it growing in wet places at the water's edge in Tamaulipas. In Alabama it has been found along sandy dry open roadsides. The corollas are described as "blue" on S. S. White 1359. Hutchins (1967) cites his nos. 453, 1049, & 1101 from Garza County, Texas.

Additional citations: ALABAMA: Mobile Co.: Iltis, Crosswhite, Kawano, & al. 21349 (Ws). LOUISIANA: Allen Par.: Ewan 21038 (Rf). Caldwell Par.: Ewan 19201 (Ac). Cameron Par.: Ewan 21348 (Ac). Hancock Par.: Ewan 19736 (Ac). Natchitoches Par.: Ewan 19238 (Ac). Rapides Par.: Ewan 19377 (Rf). Saint Tammany Par.: DeWolf 743 (Ms--34317). TEXAS: Calhoun Co.: Demaree 22711 (Ms--50425). Cass Co.: Demaree 53842 (Ac). Grayson Co.: H. Gentry 50-198 (Ms--34291). Harris Co.: Nickerson s.n. [April 10, 1950] (Ms--34287). Lavaca Co.: Strother 185 (Du--511234). Webb Co.: Edw. Palmer 1043 (Ms--30802). Wilson Co.: S. S. White 1359 (Mi). MEXICO: Tamaulipas: Dominguez M. & McCart 8183 (Du--511274).

VERBENA HASTATA L.

Additional & emended bibliography: Bischoff, Handb. Bot. Term. 1: Erk. Taf. [9], pl. 22, fig. 651. 1830; Bischoff, Organ. Syst. Art. Regist. 23. 1849; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 336. 1878; Fowler, Rep. Soc. Agr. N. Bruns. 1878, App. B: 47. 1879; G. U. Hay, Bull. Nat. Hist. Soc. N. Bruns. 2: 30. 1883; J. Macoun, Cat. Can. Pl. 1: 379. 1884; Fowler, Bull. Nat. Hist. Soc. N. Bruns. 4: 50. 1885; A. Gray, Syn. Fl. N. Am., ed. 2, 2 (1): 336. 1886; G. H. Buek, Wild Fls. Am. 1 (1): [11--12], pl. 9. 1894; S. N. F. Sanford, Rhodora 6: 88. 1904; P. B. Kennedy, Annot. List Wild Fls. Calif. 112. 1917; Grieve & Leyel, Modern Herb., pr. 1, 2: 831--832. 1931; E. S. & F. E. Clements, Natl. Geogr. Mag. 76: 240. 1939; E. R. Spencer, Just Weeds 201, 203, & 204. 1940; A. H. Holmgren, Handb. Vasc. Pl. North. Wasatch 145. 1948; L. H. Bailey, Man. Cult. Pl., ed. 2, 840 & 1113. 1949; Russell, Ledingham, & Coupland in Fraser & Russell, Annot. List Pl. Saskat. 36. 1953; Hylander, Macm. Wild Flow. Book 33 & 337, pl. 166L. 1954; H. L. Mason, Fl. Marshes Calif. 677. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Hagmeier, N. Bruns. Fl. 13. 1959; R. M. Carleton, Ind. Common Names Herb. Pl. 15 & 17. 1959; Grieve & Leyel, Modern Herb., pr. 2, 2: 831--832. 1959; Martin & Bradley, Seed Ident. Man. 35 & 194, fig. 235 & 260. 1961; Marie-Victorin, Fl. Laurent., ed. 2, 489 & 490, fig. 170. 1964; Mohlenbrock & Voigt, Trans. Ill. Acad. Sci. 58 (4): 295. 1965; Boivin, Naturaliste Can. 93: 429. 1966; Gaiser & Moore, Surv. Vasc. Pl. Lambton Co. 100. 1966; Hartley, Univ. Iowa Stud. Nat. Hist. 21: 144. 1966; Wunderlin, Trans. Ill. Acad. Sci. 59 (2): 143. 1966.

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UNA NUEVA ESPECIE DE PORTULACA DE BRASIL

C. Diego Legrand

PORTULACA EITENII nov. sp.

Radix tenui-ramosa in extremo inferiore caudicis prostrato 5 cm. long., opposito extremo multiramoso, ramis diffusis aliquantulum subdivisis inter 6-9 cm. long. Folia caulinarum alterna, remota, lineari-suboblunga, subpetiolata, apice obtuso usque rotundato, inter 3-7 mm. long., 1-1,5 mm. lat. Pili axillares pauci, breves, maximi circiter 1 mm. long. FLORES terminales, sessiles, pauci agglomerati, involucri 6-10-foliato cincti; haec quam caulinarum paulo maiora et quibus aliqua ad decem milimetra et eorum pilis axillaribus ad unum milimetrum cum dimidio attingunt. Flores ex maxima parte parvi (sunt), cleistogami ut videntur, omnes cum eorum pseudosepalis marcescentibus, sub forma cuculli implicatis super capsulam juvenem, post tempus caducam. Pseudosepala ovato-triangularia apice vix cuculliforme, marginibus hyalinis cetera floralia organa implicando.

In parvis floribus longitudinem ad 2 mm. long., in maioribus ad 3,5 mm. habent, basi usque ad dimidium milimetrum concretescens. Tepala oblonga aliquantulum minora, colore ignoto. Stamina usque 12 filamentis paene milimetralis, basi in annulo perygino membranaceo 0,5 mm. juncta. Stylus brevis, rami stigmatosi 4, lineares. Capsula matura circiter 4 mm. in medio v. vix infra medium circumscissa, pars inferior turbinata, operculum nitidum campanulatum. Semina subnumerosa argentea, opaca, stellulato-tuberculata, tuberculis conicis obtusiusculis subvalidis.

Raiz ramosa fina en el extremo inferior de un caudex postrado de unos 5 cm., que da nacimiento hacia el ápice a numerosas ramas difusas y algo subdivididas de hasta 6-9 cm. de largo. Hojas caulinares alternas, distantes, subpetioladas, lineal-suboblongas, de ápice obtuso hasta redondeado, midiendo unos 3-7 mm. de largo por 1-1,5 mm. de ancho. Pelos axilares muy pocos y breves, de hasta 1 mm. los mayores.---Flores terminales sésiles, pauciglomeradas, rodeadas por involucrios de unas 6-10 hojas un poco mayores que las caulinares, llegando algunas hasta 10 mm. Los pelos axilares de las mismas son apenas mas numerosos, llegando hasta 1,5 mm. Las flores en su mayor parte son pequeñas, al parecer cleistógamas; una sola observada aparentemente bien desarrollada, todas con sus pseudosépalos marcescentes, arrollados en forma de capucha sobre la cápsula joven, mas tarde caediza.

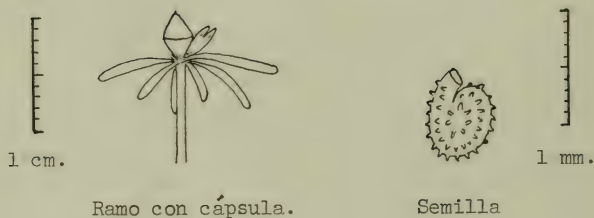
Pseudosépalos aovado-triangulares, el interior con el ápice apenas cuculliforme en el ápice y con márgenes hialinos envolviendo los demás órganos florales. En las flores pequeñas miden 2 mm. de largo, en las mayores 3,5 mm. y otro tanto de ancho en la base. La base es concretescente entre ambos hasta 0,5 mm. de altura. Tepalos oblongos algo menores de color desconocido. Estambres pocos, hasta 12, con filetes de casi 1 mm. naciendo sobre un anillo membranaceo perigino de 0,5 mm. de ancho. Estilo breve

con 4 ramas estigmáticas lineales midiendo en su totalidad unos 2 mm. Cápsula madura de unos 4 mm. circuncisa en la mitad o apenas mas abajo; la base turbinada opaca y el opérculo campanulado, nítido. Semillas gruesas, de 0,75 mm. de largo por 0,62 mm. de ancho, en promedio. Superficie plateada opaca, con tuberculos cónicos un poco obtusos, medianamente fuertes, rodeados en la base por arrugas esteluladas bién marcadas.

Typus, Brasil, Maranhao, Catalina, leg. G. E. & L. T. Eiten 3582 (US).

Obs. La especie es afín a P. hoehnei Legr. de Mato Grosso, que tiene cápsulas abiertas bastante mas abajo de la mitad, semillas negras y otras diferencias menores. P. smallii Wils. del sureste de Estados Unidos es también una especie muy parecida, diferenciándose principalmente por sus cápsulas frecuentemente un poco pediceladas, sus mechones pilosos mayores y sus semillas oscuras.

Las tres especies se incluyen en la Subsección PILOSAE Legr.



BOOK REVIEWS

Alma L. Moldenke

"A Dictionary of Flowering Plants and Ferns" by J. C. Willis, Seventh Edition revised by H. K. Airy Shaw, xxii & 1214 & liii pp., Cambridge University Press. London & New York 10022. 1966. £5 or \$18.50.

From 1897 until last year plant taxonomists and others have been very grateful to the "Willis" in its several editions and revisions for the vast amount of accurate and easily accessible material on generic and family seed plant and fern names, economic products, common names and botanical terms. This new edition omits the last three topics, but offers a thorough revision of the first, and it will cause many more botanists to respond gratefully for "Willis & Airy Shaw".

"The 40,000 entries attempt to cover all published (whether validly or not) generic names from 1753 onwards and published family names from 1789, together with a number of supra- and infra-familial taxa where these have not been based on family or generic names. The uninomials of Ehrhart and Du Petit Thouars are also listed." This involves a tremendous amount of valuable work.

While checking through for entries involving the Verbenaceae and the Eriocaulaceae I encountered a few names not hitherto known to us, only some of the orthographic variations recorded, and a few differences of opinion, as, for example, on p. 250 the generic name Citharexylum is accredited to Miller instead of to Jussieu and on p. 326 the variant spelling Cytharexylum Jacq. is assigned to "Citharexylon L. (Verbenac.)" Page liii lists the Lamiales on "li" instead of "l".

A valuable new feature is the inclusion of the alternative sign (~) in some of the cases where certain authorities accept a genus as valid which others include in synonymy elsewhere, thus making allowances for differences in taxonomic opinions.

"Directory of Bioscience Departments in the United States and Canada" sponsored by the American Institute of Biological Sciences and compiled under the direction of J. David Lockard, xvi & 672 pp. Reinhold Publishing Corporation, New York, London, & Amsterdam. 1967. \$8.50.

The Office of Biological Information of the A. I. B. S. has just rendered another valuable service to biologists, biologists-to-be and the many people connected with the academic world in having this volume prepared.

All accredited junior colleges, colleges and universities of both countries along with their associated field stations and

laboratories have been canvassed. Those responding include 1,112 colleges and universities covering 1,846 departments and 300 non-degree granting institutions. Approximately 25,000 current teaching faculty and administrators are listed.

Information is arranged alphabetically by provinces or states and gives for each bioscience department its staff with its members' dated highest degrees, its courses offered - undergraduate and graduate - and its requirements for the major.

Updating by computer procedures will be used for new editions every two years.

"Wild Season" by Allan W. Eckert, 244 pp., illus. Little, Brown and Co., Boston, Mass. 02106 and Toronto. 1967. \$4.95.

"Wild Season" is the increasingly sunful, warming, life-alerting month of May in the vicinity of Oak Lake near the Illinois-Wisconsin border. Here the author catalogues daily what his skilled eyes and other senses, his fine mind, his good heart, and his pleasant writing style behold in the interplay of organism upon organism in terms of its environment. It is real drama; it is also excellent ecological reporting.

This quotation from the epilogue gives the author's orientation and the various creatures' stories' summary: - "a beautiful, constantly moving, constantly changing story of birth and life and death, frequently harsh and often times frightening, but never maliciously cruel.

"For in nature's book, everything has its place and its time; there exists a persistent interdependency of its creatures one upon another.

"And there is never waste.

"There are, amongst the hundreds and thousands of individual stories, many which end in sudden and violent death, but despite this it is a volume with a strange and everlasting timelessness. And there is, over all, a pervading sense of peace."

"A List of the Orders and Families of Anthophyta (Angiospermae) with Generic Names" by Fred A. Barkley, 222 pp. University of Bagdad, Iraq, 1965, and Hopkins Press, Providence, Rhode Island, 1966. \$3.50.

This comprehensive useful work has undergone a 20-year period of growth as Hutchinson's arrangement was adapted for teaching and herbarium work successively in the Rocky Mountain area, the southwestern part of this country, the island of Jamaica, Mexico, Colombia and Iraq. In later editions some orders are arranged and composed differently, especially where they seem to be of polyphyletic origin. It even includes some generic names not listed in the new seventh edition of Willis.

"Florula Ludoviciana or a Flora of the State of Louisiana" by C. S. Rafinesque, translated, revised and improved from the French of C. C. Robin, facsimile of the 1817 edition, introduction by Joseph Ewan, xl & 178 pp., Hafner Publishing Company, New York & London. 1967. \$12.50.

Modern reproduction processes now make it easy for our home and institutional libraries to acquire copies of rare old works. They usually come out enriched with critically valuable introductions and helpful indexing. And so it is with the first three already published facsimile works of the CLASSICA BOTANICA AMERICANA series which is under the well chosen editorship of Dr. Ewan. Since most of his training and experience have been in taxonomic botany and the history of botany and since his state of operation has been Louisiana for many years, he can and has given a valuable appraisal of the person and work of this amazing, eccentric genius whose very vehemence in defending his taxonomic innovations surely helped to keep them from being accepted. This "Florula" is significant as the first localized record of plants from southern Louisiana.

"Texas Research Foundation - Its Historical Background through 1966" by Roy Roddy, vii & 92 pp., illus., Texas Research Foundation, Renner, Texas. 1967.

The journalist-author gives here the story of the founding of this privately supported research institution dedicated to the rebuilding of Texas agriculture after extensive crop growing had depleted the local blackland soil of its organic minerals, and of its contributions under the dedicated and skilled directorship of Dr. C. L. Lundell and local founders.

"Agricultural Research at Renner, 1944-1966" edited by Cyrus Longworth Lundell, xii & ca. 400 pp., illus., Texas Research Foundation, Renner, Texas. 1967.

This book is composed of the papers covering the various agricultural projects undertaken at this institution to analyze and solve theoretical and practical problems of this immediate tall grass-blackland area. The individual papers are well written, well illustrated, well documented and well provided with ample bibliography. Unfortunately each paper has its own pagination only, and therefore there is no additional overall book pagination. Consequently there can be no complete index which could make the contents that much more available to readers.

It is impressive to learn that all this valuable study has been financed by the people of the area served.

NOTES ON BROMELIACEAE, XXVII

Lyman B. Smith

AECHMEA

AECHMEA CASTELNAVII Baker, Handb. Bromel. 39. 1889. Type: Castelnau s. n. Aechmea paniculigera sensu Baker, op. c. 40, in part, not as to type. Ae. sprucei Mez in DC. Mon. 9: 226. 1896. Type: Spruce 140. Pl. I, fig. 1: Trichome of inflorescence x 10.

COSTA RICA: ALAJUELA: On tree, Capulín, Río Grande de Tarcoles, alt. 80 m, 2 April 1924, Standley 40183 (US).

VENEZUELA: LARA: Margin of pond, Santa Rosa, alt. 400 m, 16 Jan. 1939, Alston 6329 (BM, US). BOLÍVAR: Moist woods, mouth of Caño Bejuco, Río Parguaza, alt. 140 m, 15 April 1946, Badillo 1429 (VEN).

COLOMBIA: VICHADA: Epiphytic, dense forest, bank of Río Guaviare, Amanabel, alt. 250 m, 23 Nov. 1948, Araque & Barkley 18-V-129 (US).

BOLIVIA: SANTA CRUZ: June 1847, Castelnau s. n. (P, type; phot. GH).

BRAZIL: AMAZONAS: Epiphytic, Taperinha, Santarem, 22 Aug., 1927, Ginzberger s. n. (W); Ginzberger & Zerny 392 (F). PARA: Spruce 104 (K, type of Aechmea sprucei Mez; phot. GH). Approagas Rio Capim, July 1897, Huber s. n. (MG); 695 (G). On tree, Tome Assú, Dist. Acará, alt. 35 m, 1 Aug. 1931, Mexia 6032 (GH, US). São Miguel do Guamá, Rio Guamá and Rio Irituia, 22-23 Aug. 1948, Dárdano & Black 48-3162 (IAN); 48-3195 (IAN). Epiphytic, km 261-255 of the Belém-Brasília highway, 10 July 1960, E. Oliveira 904 (IAN). Epiphytic, Rio Vizeu, region of Cametá, 8 Feb. 1961, E. Oliveira 1320 (IAN). Riverine forest, banks of Rio Piria, south of BR 22, 23 Aug. 1964, Prance & Silva 58837 (NY). MARANHÃO: 1824, Hesketh s. n. (CGE, phot. GH). Epiphytic, forest, 15 km south of border Pará-Maranhão, Belém-Brasília highway, 31 Aug. 1964, Prance & Silva 58973 (NY, US). CEARÁ: On carnauba palms along Rio Pacoti, 6 km south of Aquiraz, 15 Oct. 1935, Drouet 2616 (GH, US). Serra da Baturité, July 1961, Mee 45 (SP). GOIÁS: Epiphytic, low woods, Igarapé Ucuricaca, region of Araguaia, 23 Aug. 1961, E. Oliveira 1818 (IAN).

Examination of the type of Aechmea castelnavii Baker shows that it has the same unusual trichomes in the inflorescence as Aechmea sprucei Mez. Mez's supposed distinction in the shape of the anthers is not very convincing in the face of all the similarities between the two types.

AECHMEA SMITHIORUM Mez in DC. Mon. 9: 246. 1896; L. B. Smith. No. Am. Fl. 19: 209. 1938. Ae. serrata sensu Duss, Fl. Phan. Ant. Franç. 570. 1897, non (L.) Mez 1896. Ae. lavandulacea C. H. Wright, Bot. Mag. 131: pl. 8005. 1905; L. B. Smith, No. Am. Fl. 19: 209. 1938.

LESSER ANTILLES: MONTSERRAT: Blakes, on trees, foot of the

mountains, 8 Feb. 1907, Shafer 472 (NY, US). On rocks, Harris Lookout, 14-18 June 1950, Howard 11876 (GH, inflorescence dense, stipe 20 mm long). On top of cliff, Harris's, alt. 240-300 m, 2 Feb. 1959, Proctor 18979 (AA, US, spikes spreading, long-stipitate).

GUADELOUPE: On trees, Bois de Matouba and Des Baines, 1894, Duss 3325 (US, spikes spreading, long-stipitate, basis of Aechmea serrata sensu Duss). Epiphytic, dense wet forest, Baines-jaunes, alt. 850 m, 15 Feb. 1936, Stehlé 886 (US, spikes suberect, long-stipitate). Dense wet forest, Malanga (ravine road), alt. 800 m, 1 Jan. 1937, Stehlé 1525 (US, spikes spreading, long-stipitate). On tree, Ravine Montebello, alt. 50 m, 28 Jan. 1938, Questel 502 (US, spikes spreading, long-stipitate). On tree, mountains above St. Claude, 27 Oct. 1938, L. H. & E. Z. Bailey 88 (GH, US, spikes spreading, long-stipitate).

DOMINICA: Rainforest on the precipitous slopes of Morne Colla Anglais, Sylvania, alt. 610-732 m, 19 Feb. 1940, Hodge 3991 (GH). Epiphytic, rainforest between Laudat and Freshwater Lake, alt. 665 m, 8 March 1940, Hodge 1823 (GH, 1-1.3 m tall, spikes spreading, long-stipitate). On 8 March 1946, Beard 647 (US).

MARTINIQUE: Epiphytic, Bois du Lorrain, Mt. Pelée, Sept. 1881, Duss 272 (US, spikes spreading, long-stipitate).

ST. LUCIA: Terrestrial, Le Toc to Cul de Sac Bay, April-May 1950, Howard 11366 (GH, inflorescence dense, stipe 2 cm long). Epiphytic, trail from Quillesse to Piton St. Esprit, April-May 1950, Howard 11626 (GH, inflorescence dense, stipe 12 mm long). Terrestrial, shores of Marigot Lagoon, west coast, alt. 30-200 m, 21 March 1956, A. C. Smith 10203 (US, stipes suberect, 15 mm long).

ST. VINCENT: Guilding (K, phot. GH, inflorescence dense, stipes short). Terrestrial, Calvary, Dec. 1889, Eggers 6666 (US). In trees, mountain forest, alt. 300-600 m, Jan. 1890, H. H. & G. W. Smith 1425 (B, type, phot. US, inflorescence dense, stipes very short but young); same, 1426 (GH). Rainforest, Buccament Valley, alt. 300 m, 21 Nov. 1945, Beard 602 (GH, inflorescence dense, stipes 8 mm long at anthesis). Epiphytic, Chateaubelair River, alt. 300-400 m, 16-25 April 1947, Morton 5406 (US, inflorescence dense, stipes short). St. Patrick Parish: Epiphytic, upper reaches of Rutland River, alt. 330 m, 20 Jan. 1962 (GH, inflorescence dense, stipes short).

GRENADA: Cliffs at St. George, on rocks overhanging the sea, flowered at Kew 21 July 1904, Broadway (K, type of Aechmea lavandulacea C. H. Wright; phot. GH, inflorescence subclax, short). Bolanio Station, 14 April 1906, Broadway (F, phot. GH).

My grouping of Aechmea serrata, dichlamydea, smithiorum and lavandulacea in the North American Flora appears to have been correct taxonomically except for the separation of the last two species. Ae. serrata is at once the oldest in point of discovery, the most distinctive with its serrate primary bracts, and the most narrowly endemic with its limitation to the single island of Martinique. The largest interisland distance by far is from Tobago to Grenada and this is the sharpest break in the group,

Ae. dichlamydea being all south of it and the others all north.

The type of Ae. smithiorum is an extreme in its complex for both density of inflorescence and shortness of stipe, characters quite possibly due to immaturity of material. Ae. lavandulacea is the opposite extreme in laxity of inflorescence and is much further from average in this respect. Its stipes, however, are far from the opposite extreme and if anything are on the short side along with those of Ae. smithiorum.

In sum, it does not seem possible to maintain Ae. lavandulacea as a separate species without setting up still another species for the specimens with long stipes and dense inflorescence and the intergradation is too much for that.

CATOPSIS

A revision of Catopsis is long overdue and requires a new approach. Originally Mez (DC. Mon. 9: 619. 1896) divided it into two subgenera, Eucatopsis with perfect flowers and equal stamens and Tridynandra with unisexual flowers and unequal stamens. However, the character of equal stamens was evidently assumed and not based on any observation, for it has never been verified for any species and in his final work (Pflanzenreich IV. Fam. 32: 426. 1935) Mez dropped the stamen character and used only the distinction between perfect and unisexual flowers.

This distinction between flower types proves untenable because species like Catopsis nutans and sessiliflora have dimorphic flowers in Mexico and Central America but never in the West Indies and South America. Incidentally, the evolution of dimorphic flowers in all three subfamilies is curiously concentrated in mainland North America with Hechtia in the Pitcairnioideae and Aechmea mariae-reginae and the monotypic Androlepis in the Bromelioideae.

My treatment of Catopsis in the North American Flora purposely dropped Mez's classification by subgenera as unwarranted by the evidence. However, I gave too much emphasis to the size of the sepals and consequently overlooked certain synonymy in dimorphic species as pointed out by Rohweder (Die Farinosae in der Vegetation von El Salvador, Abhandl. Gebiet Auslandskunde 18: 84. 1956). Unfortunately, although admitting the correctness of his findings at the time, I subsequently overlooked them. I now take the opportunity to make a more nearly perfect revision by using them.

1. Petals ligulate with a flaring bright yellow blade as long as the claw and much wider; leaf-blades not over 25 mm wide; sepals strongly asymmetric, to 15 mm long; scape slender, usually decurved. Mexico, Central America, Greater Antilles Venezuela, Ecuador.....1. C. nutans
1. Petals broad with small barely exerted blade, mostly white or flavous (unknown in C. wawraeana and werckleana where the leaf-blades are much more than 25 mm wide).

.....

2. Floral bracts exceeding the sepals, cucullate; scape often decurved; leaf-blades ligulate to narrowly subtriangular. Southern Mexico, Central America.....2. C. wangerinii
2. Floral bracts shorter than the sepals, straight at apex.
3. Leaf-blades triangular or subtriangular, attenuate.
4. Sheaths distinct, contracted into the very narrow blades.
5. Leaves to 10 cm long, their blades 5 mm wide. Central America.....3. C. juncifolia
5. Leaves 15-30 cm long, their blades 10 mm wide. Southern Mexico to Honduras.....4. C. subulata
4. Sheaths merging almost imperceptibly into the blades.
6. Sepals coriaceous, even or obscurely nerved; lower primary bracts very broadly ovate, apiculate, mostly shorter than the sterile bases of the branches. Florida, Central America and Greater Antilles to eastern Brazil.
5. C. berteroniana
6. Sepals thin, nerved; lower primary bracts mostly subtriangular and attenuate, shorter than to exceeding the sterile bases of the branches.
7. Leaf-blades to 12 mm wide, much longer than the sheaths; lower primary bracts filiform-attenuate, about equaling the spikes. Guatemala.....6. C. delicatula
7. Leaf-blades 15-70 mm wide.
8. Sepals with a broad apical white to hyaline margin soon subtended by a dark brown band.
9. Inflorescence erect; primary bracts mostly shorter than the sterile bases of the branches; sepals 4-6 mm long; leaf-blades 15-30 mm wide. Florida, West Indies, Central America, Venezuela.....7. C. floribunda
9. Inflorescence decurved; primary bracts mostly equaling the sterile bases of the branches; leaf-blades 30-60 mm wide. Southern Mexico, Central America.
8. C. paniculata
8. Sepals nearly uniform in texture and color.
10. Spikes lax; leaf-blades to 33 mm wide. Guatemala, Honduras.....9. C. montana
10. Spikes dense; leaf-blades to 70 mm wide.
11. Sepals 5 mm long; scape erect; primary bracts mostly shorter than the axillary branches. Southern Mexico.....10. C. compacta
11. Sepals 8-9 mm long.
12. Lower primary bracts equaling or exceeding the branches; leaf-blades to 40 mm wide; scape usually erect. Southern Mexico, Central America.
11. C. hahnii
12. Lower primary bracts shorter than the branches; leaf-blades to 70 mm wide; scape decurved. Southern Mexico.....12. C. mexicana
3. Leaf-blades ligulate, very broadly acute or rounded or even emarginate, apiculate.
13. Scape-bracts exceeding the internodes or rarely the highest slightly shorter.

14. Floral bracts barely exceeding the slender 1.5 mm long pedicels; sepals 2.5 mm long in fruiting material. Guatemala.....13. C. pedicellata
14. Floral bracts much larger; flowers subsessile.
15. Leaf-blades prominently pale-margined, 15-25 mm wide; staminate sepals 4.5 mm long. Mexico, Central America 14. C. morreniana
15. Leaf-blades concolorous, to 40 mm wide; staminate sepals 2 mm long. Panama.....15. C. micrantha
13. Scape-bracts mostly much shorter than the internodes.
16. Sepals subsymmetric, 15-18 mm long. Southern Mexico, Central America.....16. C. wawraana
16. Sepals strongly asymmetric, 5-9 mm long.
17. Leaves in a cylindric rosette, usually strict; sepals cuneate on the right with the wing much exceeding the midnerve, 5-6 mm long. Greater Antilles, Central America, Guiana.....17. C. nitida
17. Leaves in a funnellform rosette, arching-divergent.
18. Leaf-blades to 53 mm wide; branches of the inflorescence with long sterile bases. Costa Rica. 18. C. werckleana
18. Leaf-blades not over 25 mm wide; branches of the inflorescence, if any, with short sterile bases. West Indies and southern Mexico to southern Brazil and Peru. 19. C. sessiliflora

1. C. NUTANS (Sw.) Griseb. Fl. Brit. W. Ind. 599. 1864; Baker, Journ. Bot. 25: 176. 1887, as n. comb.

a. Var. NUTANS. Tillandsia nutans Sw. Prodr. 56. 1788. Type: Wright s. n. T. vitellina Kl. in Lk., Kl. & Otto, Ic. Pl. Rar. 101, pl. 40. 1843. Type: Otto s. n. Tussacia vitellina (Kl.) Kl. ex Beer, Bromel. 99. 1857. Pogospermum flavum Brongn. Ann. Sci. Nat. V. 1: 328. 1864. Type: Linden s. n. P. nutans (Sw.) Brongn. 1. c. Catopsis fulgens Griseb. Nachr. Ges. Wiss. Gött. "1864": 21. 1865. Type: Fendler 1507. C. vitellina (Kl.) Baker Journ. Bot. 25: 176. 1887. Flowers uniform, perfect; scape slender, mostly decurved; inflorescence mostly simple.

b. Var. ROBUSTIOR L. B. Smith, Contr. Gray Herb. 154: 34. 1945 Type: Standley 87157. Scape stout, erect or suberect, to 3 mm in diameter, scape-bracts only slightly shorter than the internodes or even partly imbricate; flowers uniform so far as known. Guatemala.

c. Var. STENOPETALA (Baker) L. B. Smith, No. Am. Fl. 19: 193. 1938. C. stenopetala Baker, Journ. Bot. 25: 176. 1887. Type: Bernouilli & Cario 685. C. tenella Mez in DC. Mon. 9: 631. 1896. Type: Liebmann Brom. 32. Flowers dimorphic, the larger, whether perfect or pistillate, indistinguishable from those of var. nutans, the smaller functionally staminate with a mostly compound inflorescence. Southern Mexico, Central America.

2. C. WANGERINII Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1126 1904. Type: Wercklé Brom. Costar. 105. C. pusilla Mez & Wercklé Fedde Rep. Spec. Nov. 14: 248. 1916. Type: Wercklé s. n. C. cu-

cullata L. B. Smith, Contr. Gray Herb. 104: 72, pl. 3, figs. 3-5. 1934. Type: Com. Geogr. Explor. Rep. Mex. 366. C. triticea L. B. Smith, op. c. 127: 19, pl. 1, figs. 8-10. 1934. Type: Matuda 2570.

3. C. JUNCIFOLIA Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1124. 1904. Type: Wercklé Brom. Costar. 133. C. lundelliana L. B. Smith, Contr. Gray Herb. 117: 6, pl. 1, figs. 6-8. 1937. Type: Lundell 6256.

4. C. SUBULATA L. B. Smith, Contr. Gray Herb. 114: 5, pl. 1, fig. 12. 1936. Type: Purpus 335.

5. C. BERTERONIANA (Schult. f.) Mez in DC. Mon. 9: 621. 1896. Renealmia pendula Gaertn. Fruct. 3: 13, pl. 182, fig. 3. 1805, non Catopsis pendula Baker, 1889. Type: Description and figure. Tillandsia pendula Thunb. ex Gaertn. Fruct. 3: 13. 1805, nomen in synon. T. berteroniana Schult. f. in R. & S. Syst. 7, pt. 2: 1221. 1830. Type: Bertero s. n. Pogospermum berteronianum (Schult. f.) Brongn. Ann. Sci. Nat. V. 1: 328. 1864. Catopsis mosenii Mez in DC. Mon. 9: 622. 1896. Type: Mosen 3475.

6. C. DELICATULA L. B. Smith, Contr. Gray Herb. 117: 4, pl. 1, figs. 4, 5. 1937. Type: Rojas 445.

7. C. FLORIBUNDA L. B. Smith, Contr. Gray Herb. 117: 5. 1937, proposed as a new combination but really a new name because supposed basonym invalid. Type: Plée s. n. Pogospermum floribundum Brongn. Ann. Sci. Nat. V. 1: 329. 1864, nomen provisorium. Catopsis nutans Griseb. Fl. Brit. W. Ind. 599. 1864; Harms, Pflanzenfam. ed. 2, 15a: 131, fig. 48 A-J. 1930; Mez, Pflanzenreich IV Fam. 32: 429, fig. 91 A-J. 1935, in part, not as to type.

8. C. PANICULATA E. Morr. in Makoy, Cat. Hort. no. 121. Oct. 1883; L. B. Smith, Phytologia 15: 179. 1967. Type: Hort. Makoy. C. pendula Baker, Handb. Bromel. 155. 1889. Type: Morren Icon.

9. C. MONTANA L. B. Smith, Contr. Gray Herb. 117: 6. 1937. Type: Ekman 16555.

10. C. COMPACTA Mez, Bull. Herb. Boiss. II. 3: 140. 1903. Type: L. C. Smith 543.

11. C. HAHNII Baker, Journ. Bot. 25: 175. 1887. Type: Hahn 587. C. oerstedia Mez in DC. Mon. 9: 630. 1896. Type: Oersted Brom. 18.

12. C. MEXICANA L. B. Smith, Contr. Gray Herb. 114: 4, pl. 1, figs. 10, 11. 1936. Type: Hinton 4692.

13. C. PEDICELLATA L. B. Smith, Contr. Gray Herb. 154: 34, pl. 4, fig. 1. 1945. Type: Steyermark 31641.

14. C. MORRENIANA Mez in DC. Mon. 9: 628. 1896. Type: Liebmann Brom. 18. C. bakeri Mez, Bull. Torrey Club 30: 435. 1903. Type: C. F. Baker 2460. C. brevifolia Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1127. 1904. Type: Wercklé Brom. Costar. 135. C. paniculata hort. ex Gentil, Fl. Cult. Serres Jard. Bot. Brux. 48. 1907; Mez, Pflanzenreich IV. Fam. 32: 433. 1935, nomen.

15. C. MICRANTHA L. B. Smith, Ann. Missouri Bot. Gard. 30: 83, fig. 1. 1943. Type: von Wedel 2236. This is possibly a natural hybrid as indicated by the dwarf plant in the same clump with quite different scape-bracts.

16. C. WAWRANEA Mez in DC. Mon. 9: 626. 1896. Type: Wawra

I-843.

17. *C. NITIDA* (Hook.) Griseb. Fl. Brit. W. Ind. 599. 1864.

Tillandsia nitida Hook. Exot. Fl. 3: pl. 218. 1827. Type: Wiles in Hort. Liverpool. *Tussacia nitida* (Hook.) Beer, Bromel. 100. 1857. *T. cornucopia* Bertero ex Beer, l. c., nomen in synonym. *Pogospermum nitidum* (Hook.) Brongn. Ann. Sci. Nat. V. 1: 328. 1864. ? *P. inconspicuum* Brongn. op. c. 329. Type: Melinon s. n. ? *Catopsis inconspicua* (Brongn.) Baker, Journ. Bot. 25: 174. 1887. *C. nutans* sensu Baker, op. c. 176, in part, not as to type.

18. *C. WERCKLEANA* Mez, Bull. Herb. Boiss. II. 4: 1125. 1904. Type: Wercklé Brom. Costar. 65.

19. *C. SESSILIFLORA* (R. & P.) Mez in DC. Mon. 9: 625. 1896.

a. Var. *SESSILIFLORA*. *Tillandsia sessiliflora* R. & P. Fl. Peruv. 3: 42, pl. 271, fig. b. 1802. Type: Ruiz & Pavon s. n. *Bromelia sessiliflora* Lodd. ex Loud. Hort. Brit. 118. 1830. *Tussacia sessiliflora* (R. & P.) Beer, Bromel. 101. 1857. *Pogospermum sessiliflorum* (R. & P.) Brongn. Ann. Sci. Nat. V. 1: 328. 1864. *Catopsis nutans* sensu Baker, Journ. Bot. 25: 176. 1887, in part, not as to type. *C. nutans* var. *erecta* Wittm. Bot. Jahrb. 11: 71. 1889. Type: Lehmann 1088. *C. modesta* Fritz Müller, Gartenflora 42: 717. 1893. Type: F. Müller s. n.

b. Var. *DIOICA* L. B. Smith, Wrightia 2: 64, fig. 9. 1960. Type: Gentle 6186. *Tillandsia aloides* Schlecht. & Cham. Linnaea 6: 55. 1831. Type: Schiede & Deppe 1009. *T. apicroides* Schlecht. & Cham. l. c. Type: Schiede 1010. *Tussacia apicroides* Beer, Bromel. 263. 1857, nomen in synonym. *Catopsis apicroides* (Schlecht. & Cham.) Baker, Journ. Bot. 25: 174. 1887. *C. aloides* (Schlecht. & Cham.) Baker, Handb. Bromel. 154. 1889. *Tussacia aloides* E. Morr. ex André, Brom. Andr. 61. 1889, nomen in synonym. *Catopsis vitellina* Baker, Journ. Bot. 25: 176. 1887, in part, not as to type. *C. schindleri* Mez & Wercklé, Bull. Herb. Boiss. II. 4: 1124. 1904. Type: Wercklé Brom. Costar. 136. *C. tenuis* Cufo-dontis, Archivio Bot. 9: 181. 1933. Type: Cufodontis 720. Flowers dimorphic, the smaller functionally staminate with inflorescence usually compound.

INDEX

(by species numbers of *Catopsis*)*BROMELIA sessiliflora* 19-a.

CATOPSIS aloides 19-b; *apicroides* 19-b; *bakeri* 14; *berteroniana* 5; *brevifolia* 14; *compacta* 10; *cucullata* 2; *delicatula* 6; *floribunda* 7; *fulgens* 1-a; *hahnii* 11; *inconspicua* 17; *juncifolia* 3; *lundelliana* 3; *mexicana* 12; *micrantha* 15; *modesta* 19-a; *montana* 9; *morreniana* 14; *mosenii* 5; *nitida* 17; *nutans* Baker 1, 17, 19-a; *nutans* Griseb. 1; var. *robustior* 1-b; var. *stenopetala* 1-c; *oerstediana* 11; *paniculata hort.* 14; *paniculata* E. Morr. 8; *pedicellata* 13; *pendula* 8; *pusilla* 2; *schindleri* 19-b; *sessiliflora* 19; var. *dioica* 19-b; *stenopetala* 1-c; *subulata* 4; *tenella* 1-c; *tenuis* 19-b; *triticea* 2; *vitellina* Baker 19-b; *vitellina* Lk. 1-a; *wangerinii* 2; *wawraea* 16; *werckleana* 18.

POGOSPERMUM berteronianum 5; *flavum* 1; *floribundum* 7; *inconspi-*

cuum 17; nitidum 17; nutans 1-a; sessiliflorum 19-a.

RENEALMIA pendula 5.

TILLANDSIA aloides 19-b; apicroides 19-b; berteroniana 5; nitida 17; nutans 1; pendula 5; sessiliflora 19-a; vitellina 1-a.

TUSSACIA aloides 19-b; apicroides 19-b; cornucopia 17; nitida 17; sessiliflora 19-a; vitellina 1-a.

APPENDIX

(Excluded taxa)

alba E. Morr. ex Baker, Handb. Bromel. 192. 1889 = TILLANDSIA MONADELPHA (E. Morr.) Baker

deflexa Ule, Ber. Deutsch. Bot. Gesellsch. 18: 323, pl. 10, figs. 1-6. 1900 = TILLANDSIA AERIS-INCOLA (Mez) Mez

fendleri Baker, Journ. Bot. 25: 175. 1887 = TILLANDSIA CARI-BAEA L. B. Smith

flexuosa Baker, Journ. Bot. 25: 175. 1887 = TILLANDSIA BAKERI L. B. Smith

garckeana Wittm. Bot. Jahrb. 11: 70. 1889 = TILLANDSIA TETRANTHA R. & P. var. AURANTIACA (Griseb.) L. B. Smith

gracilis Rusby, Bull. N. Y. Bot. Gard. 6: 489. 1910 = FOSTERELLA GRACILIS (Rusby) L. B. Smith

latifolia Ule, Verhandl. Bot. Ver. Brandenb. 48: 142. 1907 = TILLANDSIA BREVILINGUA Mez ex Harms

maculata E. Morr. ex Baker, Handb. Bromel. 155. 1889 = TILLANDSIA AERIS-INCOLA (Mez) Mez

penduliflora C. H. Wright, Kew Bull. 1910: 197. 1910 = FOSTERELLA PENDULIFLORA (C. H. Wright) L. B. Smith

schumanniana Wittm. Bot. Jahrb. 11: 70. 1889 = TILLANDSIA AD-PRESSA André var. TONDUZIANA (Mez) L. B. Smith

tripinnata Baker, Handb. Bromel. 156. 1889 = TILLANDSIA TRIPINNATA (Baker) Mez

ENCHOLIRIUM

ENCHOLIRIUM GRACILE L. B. Smith, sp. nov. A E. lutzii L. B. Smith, cui affinis, foliis glabris, inflorescentia simplici (an semper?), floribus majoribus, ovulis apice longe caudatis differt

PLANT flowering 1.35 m high. LEAVES (only the inner known) to 4 dm long; sheaths inconspicuous; blades very narrowly triangular 15 mm wide, glabrous, laxly serrate with spreading spines 5 mm long. SCAPE erect, 8 mm thick near base, glabrous; lower scape-bracts subfoliaceous but much reduced, the upper narrowly triangular, entire, much shorter than the internodes. INFLORESCENCE simple, lax, 25 cm long, glabrous; axis slender, curved. FLORAL BRACTS broadly ovate, apiculate, shorter than the pedicels; pedicels spreading, 6 mm long, 3 mm wide, sulcate when dry. SEPALS very broadly elliptic, subtruncate, 8 mm long; petals narrowly elliptic, obtuse, 15 mm long, cream (! Belém); stamens nearly equaling the petals; anthers linear with a cordate base, 4 mm long, greenish (! Belém); ovules numerous, obliquely long-caudate at apex. Pl. I, fig. 2: Flower x 1; 3: Sepal x 1; 4: Ovule x 10.

BRAZIL: MINAS GERAIS: On calcareous outcrop, along road from Nanuque to Teófilo Otoni, 14 Aug. 1965, R. P. Belém 1620 (US, type; hb. Univ. Brasilia, isotype).

GREIGIA

In the nineteen years since my last brief revision of Greigia (Contrib. U. S. Nat. Herb. 29: 286-292. 1949), seven additional species have appeared. The present work is intended to place these in relation to the others and by changes of the key to look at the older species from a new perspective. The genus, although small, remains one of the most difficult to classify because of scanty material and the lack of characters that inspire much confidence. Skottsberg's division with only the type species remaining in Greigia and the remainder consigned to the new Hesperogreigia is impossible to verify at present, and at best seems to be based on distinctions not considered important elsewhere in the family.

In the key I am using "outer bracts" to combine the large uppermost scape-bracts with the primary bracts.

1. Sepals to 40 mm long; floral bracts serrulate; leaf-spines 3-4 mm long. Chile.....1. G. sphacelata
1. Sepals not more than 27 mm long.
 2. Primary bracts wholly covered with brilliant white appressed scales; upper scape-bracts abruptly subulate-laminate. Amazonian Peru.....2. G. amazonica
 2. Primary bracts only partially vestite with dull white or colored scales, or glabrous.
 3. Upper scape-bracts triangular-ovate without distinction between base and blade.
 4. Sepals not over 16 mm long; primary bracts entire or subentire; leaf-blades partially lepidote.
 5. Teeth restricted to the apical quarter of the flat leaf-blade, minute; sheaths narrow, pale, indistinct. Chile. 3. G. pearcei
 5. Teeth not restricted to the apical quarter of the leaf-blade; sheaths broad, dark, distinct. Colombia.
 6. Leaf-blades flat; sepals 15-16 mm long.
 7. Sepals coriaceous, even, castaneous; leaf-blades soon glabrous; sheaths subdensely brown-lepidote. 4. G. danielii
 7. Sepals thin, nerved, pale; leaf-blades and sheaths densely cinereous-lepidote beneath.....5. G. collina
 6. Leaf-blades soon revolute; sepals 10-11 mm long.
 8. Leaf-blades minutely serrulate with teeth less than 0.5 mm long, densely cinereous-lepidote above. 6. G. racinae
 8. Leaf-blades with slender basal spines up to 5 mm long, sparsely lepidote and soon glabrous above. 7. G. nubigena

4. Sepals more than 16 mm long or else the primary bracts strongly serrate.
9. Upper scape-bracts 7-8 cm long.
10. Leaf-sheaths elliptic, 15 cm long, very dark castaneous; primary bracts entire or nearly so. Mexico.
8. G. van-hyningii
10. Leaf-sheaths inconspicuous, pale; primary bracts distinctly serrate. Salvador.....9. G. rohweri
9. Upper scape-bracts scarcely more than 4 cm long.
11. Outer bracts entire or subentire, thin, strongly nerved; sepals 12 mm long. Mexico.....10. G. juareziana
11. Outer bracts strongly serrate; sepals 15-22 mm long.
12. Outer bracts green; sepals 15 mm long. Costa Rica.
11. G. sylvicola
12. Outer bracts largely castaneous, conspicuously white-lepidote; sepals 17-22 mm long.
13. Leaf-sheaths subdensely serrate with dark stout spines 4 mm long; sepals 22 mm long. Guatemala.
12. G. steyermarkii
13. Leaf-sheaths serrulate with spines 1 mm long; sepals 17 mm long. Mexico.....13. G. oaxacana
3. Upper scape-bracts rounded-apiculate with good distinction between base and blade.
14. Outer bracts largely or wholly green.
15. Primary bracts entire or subentire, much thickened at apex; scales of leaf-blade black-centered, very sparse. Venezuela.....14. G. ocellata
15. Primary bracts strongly serrate toward apex; scales of leaf-blade wholly white, dense.
16. Sepals and primary bracts castaneous toward base; plant subacaulescent. Venezuela.....15. G. albo-rosea
16. Sepals and primary bracts wholly green; plant 12 dm or higher. Colombia.....16. G. sanctae-martae
14. Outer bracts wholly dark castaneous or with pale borders or apices (uncertain in G. berteroi).
17. Leaf-blades in large part entire, the spines all less than 1 mm long or a few larger ones near base.
18. Blades 28-48 mm wide.
19. Primary bracts serrate; leaf-blades to 28 mm wide. Ecuador.....17. G. sodiroana
19. Primary bracts entire; leaf-blades to 48 mm wide. Chile.....18. G. landbeckii
18. Blades 16-18 mm wide.
20. Sheaths pale brown; blades serrate only toward apex. Chile: Juan Fernandez.....19. G. berteroi
20. Sheaths dark castaneous; blades serrulate at base as well as apex. Venezuela.....20. G. aristeguietae
17. Leaf-bases strongly serrate, especially at base, with spines 4-12 mm long.
21. Primary bracts with a prominent green blade. Colombia.
21. G. columbiana
21. Primary bracts merely apiculate or castaneous at apex.

22. Leaf-blades 22 mm wide; primary bracts with a narrowly triangular blade. Peru.....22. G. macbrideana
22. Leaf-blades 40-50 mm wide; primary bracts mostly apiculate.
23. Primary bracts much shorter than the sepals, barely exceeding the ovaries, sparsely serrate. Colombia.
23. G. exserta
23. Primary bracts equaling or exceeding the sepals.
24. Leaf-blades coarsely serrate throughout; nearly or all of the margin of the primary bracts serrate; sepals asymmetric. Colombia, Ecuador.
24. G. vulcanica
24. Leaf-blades coarsely serrate only at base; primary bracts serrate only near apex; sepals symmetric.
Ecuador.....25. G. mulfordii
1. G. SPHACELATA (R. & P.) Regel, Gartenflora 14: 137, pl. 474 1865. Bromelia sphacelata R. & P. Fl. Peruv. 3: 32. 1802. Type: Ruiz & Pavon s. n. Billbergia sphacelata (R. & P.) Schult. f. in R. & S. Syst. 7, pt. 2: 1269. 1830. Bromelia discolor Lindl. Bot. Reg. 24, Misc.: 48. 1838. Type: Hort. Garnier. Bromelia crassa Steud. in Lechler, Bearb. Am. Austr. 53. 1857. Nomen based on Lechler 677. Bromelia clandestina hort. ex Carr. Rev. Hort. 52: 256. 1880. Nomen in synonym.
2. G. AMAZONICA L. B. Smith, Phytologia 8: 226, pl. 2, figs. 4, 5. 1962. Type: Moore A-120.
3. G. PEARCEI Mez in DC. Mon. 9: 46. 1896. Type: Pearce 269. Bromelia pearcei anonymous ex Baker, Handb. Brom. 13. 1889. Nomen. Greigia landbeckii Baker, l. c. In part, non Phil.
4. G. DANIELII L. B. Smith, Caldasia 5: 1, fig. 1948. Type: Daniel 3428.
5. G. COLLINA L. B. Smith, Contr. U. S. Nat. Herb. 29: 286, fig. 11. 1949. Type: Foster 1868.
6. G. RACINAE L. B. Smith, Contr. U. S. Nat. Herb. 29: 288, fig. 14. 1949. Type: Foster 2044.
7. G. NUBIGENA L. B. Smith, Contr. U. S. Nat. Herb. 29: 287, fig. 13. 1949. Type: Foster 2043.
8. G. VAN-HYNINGII L. B. Smith, Bromel. Soc. Bull. 9: 53, figs 1959. Type: Van Hyning 5910.
9. G. ROHWEDERI L. B. Smith, Phytologia 13: 456, pl. 1, figs. 6, 7. 1966. Type: Rohweder no. El Salvador 526.
10. G. JUAREZIANA L. B. Smith, Bromel. Soc. Bull. 9: 51, fig. 1959. Type: Van Hyning 5962.
11. G. SYLVICOLA Standl. Journ. Washington Acad. 17: 160. 1927 Type: Standley 41975.
12. G. STEYERMARKII L. B. Smith, Contr. Gray Herb. 154: 35, pl. 4, fig. 2. 1945. Type: Steyermark 42553.
13. G. OAXACANA L. B. Smith, Bromel. Soc. Bull. 9: 52, fig. 1959. Type: Van Hyning 5958.
14. G. OCELLATA L. B. Smith & J. A. Steyermark, sp. nov. G. albo-rosea (Griseb.) Mez in systemate mea affinis sed foliorum lepidibus atro-ocellatis, bracteis primariis subintegriss apice

valde incrassatis differt.

PLANT evidently short-caulescent. LEAVES spreading to erect, 6 dm long; sheaths ovate, ca 10 cm long, green marked irregularly with dark castaneous, very sparsely dark-lepidote; blades linear, attenuate, slightly contracted at base, to 3 cm wide, very sparsely vestite beneath with appressed dark-centered scales, serrulate toward apex, entire elsewhere or with a few dark 2 mm long teeth at base. INFLORESCENCES axillary, 4 cm wide; primary bracts broadly ovate, triangular-acute and much thickened at apex, subentire, 4 cm long, about equaling the sepals, green becoming irregularly dark castaneous toward base, sparsely dark-lepidote. FLORAL BRACTS ovate, ca 25 mm long, coriaceous and dark castaneous at apex, thinner and paler elsewhere. SEPALS subtriangular, 19 mm long, castaneous toward base and apex. Pl. I, fig. 5: Outer bract x 1/2; fig. 6: Flower x 1.

VENEZUELA: TACHIRA: Terrestrial, dwarf rainforest, below Páramo de La Negra on the road to Pregonero, alt. 2600 m, 29-30 August 1966, J. A. Steyermark & M. Rabe 96951 (US, type; VEN).

15. G. ALBO-ROSEA (Griseb.) Mez in Mart. Fl. Bras. 3, pt. 3: 247. 1891. Nidularium albo-roseum Griseb. Nachr. Ges. Wiss. Göttingen 1864: 12. 1865. Type: Fendler 1521. Karatas albo-rosea (Griseb.) Baker, Handb. Brom. 4. 1889. Cryptanthus andicola Moritz ex Baker, l. c. Nomen.

16. G. SANCTAE-MARTAE L. B. Smith, Contr. U. S. Nat. Herb. 29: 289, fig. 15. 1949. Type: Foster 1463.

17. G. SODIROANA Mez, Bull. Herb. Boiss. II. 4: 619. 1904. Type: Sodirol 171/1-a.

18. G. LANDBECKII (Lechler ex Phil.) Phil. Cat. Chil. 278. 1881. Bromelia landbeckii Lechler ex Phil. Linnaea 33: 246. 1864-65. Type: Lechler 3098.

19. G. BERTEROI Skottsberg, Nat. Hist. Juan Fernandez & Easter Island 2: 109. 1922. Type: Bertero 1219. Hesperogreigia berteroi (Skottsberg) Skottsberg, Acta Horti Gotoburgensis 11: 220. 1936.

20. G. ARISTEGUIETAE L. B. Smith, Phytologia 7: 106, pl. 1, figs. 1-3. 1960. Type: Aristeguieta 3591.

21. G. COLUMBIANA L. B. Smith, Contr. Gray Herb. 98: 7, pl. 1, figs. 7, 8. 1932. Type: Killip & Smith 18689.

a. Var. COLUMBIANA. Blades of the primary bracts densely and coarsely serrate.

b. Var. SUBINERMIS L. B. Smith, Phytologia 5: 397. 1956. Type: Garganta 980. Blades of the primary bracts very obscurely serrate.

22. G. MACBRIDEANA L. B. Smith, Contr. Gray Herb. 98: 7, pl. 1, figs. 9-11. 1932. Type: Macbride 4442.

23. G. EXSERTA L. B. Smith, Caldasia 3: 238, fig. 1945. Type: Cuatrecasas 11897.

24. G. VULCANICA André, Enum. Bromél. 3. 13 Dec. 1888; Rev. Hort. 60: 563. 16 Dec. 1888. Type: André 2664.

25. G. MULFORDII L. B. Smith, Contr. U. S. Nat. Herb. 29: 286, fig. 12. 1949. Type: Foster 2041.

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NAVIA

(Supplement to revision in Bromeliaceae of the Guayana Highland,
Mem. New York Bot. Gard. 14, pt. 3: 15. 1967;
species alphabetical)

36a. *N. INCRASSATA* Smith & Steyermark, sp. nov. A *N. pauciflora* L. B. Smith, cui valde affinis, foliis bracteisque apice incrassatis obtusisque, sepalis fortius cucullatis differt.

PLANT low, in colonies. LEAVES rosulate at the ends of the short stems; blades spreading, lance-oblong, contracted to a thick obtuse apex, 4-5 cm long, 12 mm wide, stiff-coriaceous, finely and densely serrate with the teeth becoming obscure toward apex, covered beneath with appressed cinereous scales, glabrous elsewhere except for the barbellate axils of the lower teeth. INFLORESCENCE sessile, globose, few-flowered, 1 cm wide, glabrous outer bracts foliaceous but reduced and creamy yellow for most of their length. FLORAL BRACTS lance-elliptic, obtuse and thickened at apex, slightly shorter than the sepals, broadly subcarinate, brown with scarious margins; flowers subsessile. SEPALS free, oblong, conduplicate, strongly cucullate, 7 mm long, 1 mm wide on the side, narrowly alate-carinate; ovary superior; ovules naked. Pl. I, fig. 7: Floral bract x 5; fig. 8: Sepal x 5.

VENEZUELA: BOLIVAR: On rock exposures, Meseta de Jáua, Cerro Jáua, 60 km northwest of the mission of Campamento Sanidad del Río Kanarakuni, 4° 45' N, 64° 26' W, alt. 1922-2100 m, 22-27 March 1967, J. A. Steyermark 97881 (US, type; VEN).

44a. *N. INTERMEDIA* Smith & Steyermark, sp. nov. A *N. cucullata* L. B. Smith foliorum laminis angustioribus, bracteis florigeris acutis, a *N. abysmophila* L. B. Smith bracteis florigeris apice incrassatis, a ambobus foliorum laminis supra lepidibus angustis sparse vestitis differt.

PLANT growing in colonies, caulescent; stem erect, simple, to 24 cm long, 1 cm thick, covered with the remains of old leaves. LEAVES rosulate at the stem-apex; sheaths broadly ovate, 1 cm long, yellow, glabrous; blades spreading, linear, acute, 9 cm long, 3.5 mm wide, stiff-coriaceous, dull olive-green both sides, finely serrulate throughout, glabrous beneath, bearing narrow scales above toward base, barbellate in the teeth-axils. INFLORESCENCE subsessile, very few-flowered, dense, glabrous; outer bracts like the leaves but reduced and yellowish toward base. FLORAL BRACTS broadly ovate, acute and thickened at apex, exceeding the distinctly immature sepals; flowers sessile. SEPALS free oblong, cucullate, conduplicate, at least 7 mm long (immature), 1.3 mm wide on the side, narrowly alate-carinate; ovary superior. Pl. I, fig. 9: Floral bract x 1; fig. 10: Sepal x 5.

VENEZUELA: BOLIVAR: Meseta de Jáua, Cerro Jáua, cumbre of the west central part of the meseta 60 km northwest of the mission Campamento Sanidad del Río Kanarakuni, 4° 45' N, 64° 26' W, alt. 1922-2100 m, 22-27 March 1967, J. A. Steyermark 97865 (US, type; VEN).

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45a. *N. LASTANTHA* Smith & Steyermark, sp. nov. A *N. abysmophila* L. B. Smith, cui affinis, foliorum laminis subtus dense adpresso-lepidotis, bracteis sepalisque apice dense lanoso-lepidotis differt.

PLANT growing in colonies, caulescent; stem erect, simple or few-branched, to 35 cm long, 1 cm thick, covered with the remains of old leaves. LEAVES rosulate at the stem-apices; sheaths sub-orbicular, 1 cm long, glabrous; blades spreading to reflexed, linear, acute, 4 cm long, 4 mm wide, thick, finely and densely serrulate throughout, covered beneath with a thick layer of white appressed scales, glabrous elsewhere except for the barbellate teeth-axils. INFLORESCENCE subsessile, ovoid, densely few-flowered, 8 mm wide; outer bracts like the leaves but reduced. FLORAL BRACTS lanceolate, about equaling the sepals, cucullate, entire, obtusely carinate, densely white-lanate toward apex with finely divided stellate scales; flowers subsessile. SEPALS free, narrowly lance-triangular, acute, cucullate, conduplicate, 14 mm long, 1.4 mm wide on the side, narrowly alate-carinate, densely white-lanate toward apex; ovary superior. Pl. I, fig. 11: Apex of floral bract x 5; fig. 12: Sepal x 5.

VENEZUELA: BOLIVAR: Meseta de Jáua, Cerro Jáua, cumbre of west central part of the meseta, 60 km northwest of the mission of Campamento Sanidad del Río Kanarakuni, 4° 45' N, 64° 26' W, alt. 1922-2100 m, 22-27 March 1967, *J. A. Steyermark* 97865-A (US, type; VEN).

NEOREGELIA

29. *N. BREVIFOLIA* Smith & Reitz, sp. nov.; *Phytologia* 15: 188, pl. 3, fig. 21. 1967. Nomen, because type not cited.

BRAZIL: ESPIRITO SANTO: Morro Pinga-Fogo, Castelo, 6 January 1965, *A. Seidel s. n.* (HBR, type).

I might argue that my use of the collector's name for affirmation of characters in the description constitutes citation of type, but to be perfectly sure of valid publication I am citing the type in full above.

ORTHOPHYTUM

(Supplement to revision in *Phytologia* 13: 459. 1966)

2a. *O. HUMILE* L. B. Smith, sp. nov. A *O. navioide* L. B. Smith cui valde affinis, foliorum laminis utrinque albo-lepidotis, omnibus partibus valde minoribus differt.

PLANT short-caulescent but branched. LEAVES numerous in a spreading rosette at the apex of the stem, 9 cm long; sheaths broadly ovate, thin, nerved, glabrous; blades linear, filiform-attenuate, 2.5 mm wide, covered on both sides with appressed white scales, laxly serrate with spreading spines over 1 mm long. INFLORESCENCE terminal, sessile, capitate, many-flowered, 15 mm wide. FLORAL BRACTS subfoliaceous, exceeding the sepals; flowers sessile. SEPALS free, straight, symmetric, narrowly triangular, attenuate, 9 mm long; petals free; ovary broadly obconic, 3 mm

long; epigynous tube very shallow. Pl. I, fig. 13: Section of leaf-blade x 1; fig. 14: Sepals x 1.

BRAZIL: MINAS GERAIS: Locally frequent on rocks, slopes below (north) Grao Mogul, 18 August 1960, B. Maguire, G. M. Magalhães & C. K. Maguire 49288 (US, type; NY).

PITCAIRNIA

(Supplement to revision in Phytologia 10: 1. 1964)

169a. *P. VENEZUELANA* Smith & Steyermark, sp. nov. A *P. lanuginosa* R. & P., cui affinis, scapi bracteis supremis internodia subaequantibus vel superantibus differt.

PLANT caulescent, flowering 60-75 cm high. LEAVES fasciculate at the apex of the stem, all persistent, dimorphic, the outer with sheaths broadly ovate, dark castaneous, and blades reduced to small spinose-serrate spines; inner leaves 6 cm long, slightly narrowed above the large sheath, entire; blades linear, long-attenuate, 12-18 mm wide, glabrous above, covered beneath with a white membrane of fused scales. SCAPE erect, slender, white-lepidote becoming glabrous; scape-bracts erect, the lower subfoliaceous, the upper narrowly triangular, long-attenuate, nearly equaling to exceeding the internodes. INFLORESCENCE laxly racemose, to 32 cm long, finely white-flocculose at anthesis. FLORAL BRACTS like the upper scape-bracts, exceeding the pedicels pedicels divergent, 15-22 mm long, slender. SEPALS oblong, subtruncate and apiculate, 14-20 mm long; petals to 5 cm long, orange (! Trujillo), appendaged; ovary 3/5 superior; ovules caudate. Pl. I, fig. 15: Floral bract and flower x 1; fig. 16: Sepal x 1.

VENEZUELA: PORTUGUESA: Common on calcareous bluffs and as ground cover around summit of bluff, forming dense masses, 5 km east-northeast of Agua Blanca, 22 km northeast of Acarigua, alt. 190 m, 24 August 1966, J. A. Steyermark & M. Rabe 96472 (US, type; VEN). LARA: Semiarid slopes, near Río Claro, 28 May 1964, B. Trujillo 6434 (VEN, phot. US).

PUYA

(Supplement to revision in Phytologia 10: 454. 1964)

With the present paper I am closing my description of new species in *Puya* until the genus is published in my projected monograph of the family. In a large genus such as this it is not possible to remake the key constantly.

34a. *P. ADSCENDENS* L. B. Smith, sp. nov. A *P. bicolor* Mez, cui verisimiliter affinis, ramis subduplo longioribus laxioribus, indumento cinereo differt.

PLANT known only from fragments but probably near 2 m high. LEAVES (largest?) over 4 dm long; blades very narrowly triangular 15 mm wide, glabrous above, covered beneath with appressed cinereous scales, laxly serrate with slender brown antrorse spines 5 mm long. SCAPE unknown. INFLORESCENCE laxly bipinnate, except

for the petals densely cinereous-tomentose from finely stellate scales; primary bracts broadly ovate, attenuate, to 5 cm long, slightly exceeding the sterile naked bases of the branches, chartaceous and blackish brown when dry, obscurely serrulate toward apex; branches divergent, ascending, 15 cm long (immature), slender, slightly flexuous, laxly flowered. FLORAL BRACTS broadly ovate, attenuate, 2 cm long, covering the lower half of each sepal and more or less secund with the flowers, thin, nerved dark when dry; pedicels rather slender, 5 mm long. SEPALS oblanceolate, broadly rounded and mucronulate, 23 mm long, probably fleshy in life, subcoriaceous and strongly rugose when dry; petals green (! Sagástegui). Pl. I, fig. 17: Branch of inflorescence x 1/2; fig. 18: Sepal x 1.

PERU: AMAZONAS: Prov. Chachapoyas: Slope, Jalca de Calla-Calla (Leimebamba-Balsas), alt. 2800 m, 23 Oct. 1965, A. Sagástegui A. 6073 (TRP, type; phot. US).

TILLANDSIA

T. ARENICOLA L. B. Smith, sp. nov. A T. caulescente Brongn., cui affinis, omnibus partibus minoribus, foliis patentibus, bracteis florigeris acute carinatis, sepalis posterioribus alte connatis differt.

PLANT caulescent; roots sometimes present; stem prostrate, branching, over 12 cm long. LEAVES densely polystichous, 6-7 cm long, covered with cinereous subappressed black-centered scales; sheaths ovate, small and almost indistinguishable; blades spreading, very narrowly triangular, filiform-attenuate, 6 mm wide, involute on drying. SCAPE almost none. INFLORESCENCE simple, lanceolate, acute, complanate, 25-40 mm long, 10-13 mm wide, densely few-flowered. FLORAL BRACTS imbricate and wholly covering the rhachis, ovate, acute, about equaling the sepals, coriaceous, almost wholly even, red, glabrous or with a few scales at apex, lustrous; flowers subsessile. SEPALS lanceolate, cucullate, 12 mm long, the posterior more than half connate; petals exceeding the stamens. Pl. I, fig. 19: Leaf x 1; fig. 20: Inflorescence x 1.

PERU: LA LIBERTAD: Prov. Trujillo: Rocky sandy ground, Quebrada de Laredo, 9 October 1949, N. Angulo 1254 (US, type; TRP).

T. CALCICOLA L. B. Smith & G. R. Proctor, sp. nov. A T. utriculata L., cui valde affinis, foliorum vaginis atro-castaneis, laminis ex sicco subpatente lepidotis, sepalis lepidotis differt.

PLANT flowering 1 m high, producing offsets when very young. LEAVES rosulate, numerous, to 66 cm long; sheaths ample, elliptic dark castaneous, minutely appressed-lepidote; blades narrowly triangular, attenuate to a blunt succulent apex, 4-6 cm wide at base, covered on both sides with cinereous subspreading scales. SCAPE erect, slender, sparsely lepidote; scape-bracts erect, subfoliaceous but their sheaths shorter than the internodes. INFLORESCENCE laxly paniculate, tripinnate; axis striaght, sometimes drying geniculate; primary bracts broadly ovate, much shorter

than the bracteate sterile bases of the branches; branches 25-35 cm long; spikes 15-25 cm long, very lax; rhachis nearly straight to geniculate, very slender. FLORAL BRACTS subspreading, elliptic, obtuse, 15-22 mm long, shorter than the internodes, much exceeded by the sepals, ecarinate, thin, prominently nerved; pedicels 5 mm long. SEPALs elliptic, 15-20 mm long, ecarinate, thin, prominently nerved, sparsely appressed-lepidote; petals 4 cm long, zygomorphic, greenish white; blades elliptic; stamens exerted. CAPSULE fusiform, slenderly beaked, 3 cm long. Pl. I, fig. 21: Floral bract and flower x 1; fig. 22: Sepal x 1.

JAMAICA: TRELAWNY PARISH: On vertical limestone cliff in sun, Ramgoat Cave, along road between Albert Town and Kinloss, alt. 450 m (1500 ft), 4 July 1955, Howard & Proctor 14433 (IJ); 10 April 1967 (flowering), R. W. Read 1759 (US, type; IJ, UCWI); 5 April 1967, R. W. Read 1856 (US).

T. DURATII Visiani, Ill. Piant. Nuove Ort. Bot. Padova in Nuovi Saggi Padova 5: 271, pl. 29. 1840. Type: Hort. Padua.

a. Var. DURATII. T. circinalis Griseb. Goett. Abh. 19: 272. 1874. Type: Hieronymus 149. INFLORESCENCE largely bipinnate; spikes strict. FLORAL BRACTS densely and persistently lepidote. Bolivia, Uruguay (! Mez), Argentina.

b. Var. CONFUSA (Hassler) L. B. Smith, comb. nov., stat. nov. Tillandsia confusa Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 327. 1919. Type: Hassler 3101. INFLORESCENCE 2-3-pinnate; spikes curved-spreading. FLORAL BRACTS densely and persistently lepidote. Paraguay.

c. Var. SAXATILIS (Hassler) L. B. Smith, comb. nov. T. confusa Hassler var. saxatilis Hassler, Ann. Conserv. & Jard. Bot. Genève 20: 329. 1919. Type: Hassler 3416. T. decomposita Baker, Handb. Bromel. 168. 1889. Type: Balansa 707. T. weddellii Baker op. c. 181. Type: Weddell 4035. T. tomentosa N. E. Brown, Trans. Proc. Bot. Soc. Edinburgh 20: 73. 1894. Type: Kerr s. n. T. decomposita Baker var. minor Hassler, Ann. Cons. & Jard. Bot. Genève 20: 327. 1919. Type: Hassler 3683. INFLORESCENCE 2-3-pinnate; spikes curved-spreading. FLORAL BRACTS glabrous or subglabrous. Bolivia, Paraguay, Brazil, Argentina.

T. TERES L. B. Smith, sp. nov. A T. rauhi L. B. Smith, cui affinis, omnibus partibus minoribus, spicis teretibus differt.

PLANT known only from fragments, but certainly over 7 dm long with the inflorescence extended. LEAVES rosulate (! López & Sagástegui), 5 dm long; sheaths elliptic, ample, ca 2 dm long, laxly and finely brown-lepidote beneath, densely so above; blades ligulate, rounded and apiculate, 6 cm wide, obscurely punctulate-lepidote on both sides. SCAPE decurved, stout, 1 cm thick at apex, glabrous; scape-bracts subfoliaceous, large, erect and densely imbricate. INFLORESCENCE pendent, laxly bipinnate, 3-4 dm long; primary bracts broadly ovate or the lowest subligulate, apiculate, much shorter than the spikes but exceeding their sterile bracteate bases, glaucous and rose when dry; spikes spreading, linear, terete, to 13 cm long at anthesis and 17 cm in

fruit, very dense; rhachis nearly straight, the narrow wings extending onto the bases of the floral bracts, the internodes ca 5 mm long. FLORAL BRACTS erect and very tightly imbricate, ovate, rounded and apiculate, 20 mm long, exceeding the sepals, broadly convex, ecarinate, probably somewhat fleshy, strongly nerved and somewhat rugose on drying, rose at least toward the thin apex; flowers subsessile. SEPALS elliptic, broadly obtuse, 14 mm long, subequally very short-connate, subchartaceous, the posterior carinate; petals slightly exceeding the stamens, violet (! López & Sagástegui); style slender, elongate. CAPSULE ellipsoid, about equaling the floral bracts. Pl. I, fig. 23: Primary bract and spike x 1/2; fig. 24: Sepal x 1.

PERU: CAJAMARCA: Prov. Chota: Hanging from rocks by the road, Cumbil-Llama, alt. 750 m, 21 May 1965, López & Sagástegui 5541 (TRP, type; phot. US). Prov. Santa Cruz: Hanging by road, Catache-Cumbil, alt. 800 m, 21 May 1965 (fruit), López & Sagástegui 5192 (TRP, US).

T. TRICOLOR Schlecht. & Cham. Linnaea 6: 54. 1831. Type: Schiede & Deppe 1006. T. acroleuca Mez & Purpus, Fedde Rep. Spec. Nov. 16: 72. 1919. Type: Purpus s. n.

In the North American Flora (19: 135. 1938), I placed Tillandsia acroleuca Mez & Purpus doubtfully in the synonymy of T. polystachia, but examination of the type shows that it belongs under T. tricolor var. tricolor and that, Mez to the contrary, it does not have exerted sepals.

VRIESEA

(Supplement to revision in Phytologia 13: 84. 1966,
species alphabetical)

127a. V. BITUMINOSA Wawra var. MINOR L. B. Smith, var. nov. A var. bituminosa bracteis florigeris floribusque valde minoribus differt.

FLORAL BRACTS 25 mm long. SEPALS 20 mm long.

BRAZIL: MINAS GERAIS: Tijuca and Serro highway, alt. 1300 m, 4 April 1957, E. Pereira 2861 & Pabst 3697 (RB 97988, type).

23a. V. CACUMINIS L. B. Smith, sp. nov. A V. rodigasiana E. Morr., cui affinis, foliis erectis cylindrico-rosulatis vaginis paulo distinctis, inflorescentia brevi compacta differt.

PLANT flowering 32 cm high. LEAVES erect in a cylindric rosette, 24 cm long, subdensely vestite with minute dark appressed scales; sheaths elliptic-oblong, scarcely wider than the blades but somewhat darker; blades ligulate, rounded and apiculate, 5 cm wide. SCAPE erect, slender, hidden by the leaves; upper scape-bracts barely imbricate, suborbicular, apiculate. INFLORESCENCE subdensely bipinnate, ellipsoid, 11 cm long; primary bracts like the upper scape-bracts, ca 2 cm long, punctate-lepidote at apex; branches to 3 cm long including the naked sterile base, laxly 3-4-flowered; rhachis flexuous, 1.5 mm wide. FLORAL BRACTS broadly elliptic, 15 mm long, carinate toward apex, thin-

coriaceous, nerved; pedicels obconic, 4 mm long. SEPALS oblong-elliptic, rounded, 18 mm long; petals yellow (! Schwacke). Pl. I, fig. 25: Inflorescence x 1/2; fig. 26: Sepal x 1.

BRAZIL: MINAS GERAIS: Very common, summit of Mount Serrinha, near Ibitipoca, 21° 35' S, 43° 55' W, August 1896, Schwacke 12296 (RB 112310, type).

186. V. CAPITULIGERA (Griseb.) Sm. & Pitt. Guzmania harrisii Mez in DC. Mon. Phan. 9: 927. 1896. Type: Harris Fl. Jam. 5146.

87. V. COWELLII (Mez & N. L. Britton) L. B. Smith, comb. nov. Tillandsia cowellii Mez & N. L. Britton, Bull. Herb. Boiss. II. 3: 225. 1903. Vriesea egregia L. B. Smith, Phytologia 4: 355, pl. 1, figs. 4-6. 1953.

LESSER ANTILLES: ST. KITTS: Summit of Mount Misery, September-October 1901, N. L. Britton & Cowell 553 (B, type of Tillandsia cowellii Mez & N. L. Britton).

VENEZUELA: ARAGUA: Cloud forest, Rancho Grande, alt. 1800 m, October 13, 1951, M. B. Foster 2746 (US, type of Vriesea egregia L. B. Smith).

The two types are nearly identical except that the scape is erect in the West Indian one and decurved in the Venezuelan.

162a. V. DODSONII L. B. Smith, sp. nov. V. unilaterale (Baker) Mez in systemate mea proxima sed foliis subtus insigniter albo-lepidotis, bracteis florigeris sepalisque latioribus et crassioribus differt.

PLANT flowering 18-21 cm high. LEAVES more than 20 in an obconical rosette, 13-15 cm long, strongly purple-tinged and strikingly white-lepidote beneath especially toward base; sheaths elliptic, 5 cm long; blades ligulate, broadly rounded and apiculate, 15 mm wide. SCAPE erect, slightly curved, about equaling the leaves; scape-bracts densely imbricate, ovate with a short stout apiculus, coriaceous, even, lepidote. INFLORESCENCE to 3-flowered with the terminal flower vestigial; rhachis flexuous, obtusely angled. FLORAL BRACTS somewhat less than twice as long as the internodes, becoming secund with the flowers, broadly ovate, 20 mm long, exceeded by the sepals, coriaceous, ecarinate, glabrous in age; pedicels stout, obconic, 5 mm long. SEPALS broadly elliptic, obtuse, 18 mm long, ecarinate; petals and stamens unknown. CAPSULE ellipsoid, 28 mm long. Pl. II, fig. 1: Apex of leaf x 1; fig. 2: Inflorescence x 1.

COSTA RICA: SAN JOSE: On stump on open hillcrest, 14 km south of San Isidro de el General on the road to Dominical, 2 March 1966, L. B. Smith & Calaway H. Dodson 15306 (US, type).

148a. V. DUARTEANA L. B. sp. nov. In systemate mea V. penduliflora L. B. Smith atque V. segadas-viannae L. B. Smith affinis, a priore bracteis florigeris brevibus, a posteriore ramorum basibus sterilibus nudis, a amobus foliis, scapi bracteis atque bracteis primariis inferioribus longe attenuatis distinguenda. In systemate naturali Mezii V. geniculata (Wawra) Wawra affinis

sed foliis longe attenuatis, floribus secundis differt.

PLANT flowering over 1 m high (base unknown). LEAVES presumably rosulate, to 63 cm long; sheaths elliptic, 15 cm long, covered throughout with appressed brown-centered scales; blade narrowly subtriangular, long-attenuate, 4 cm wide at base, densely and finely appressed-lepidote beneath, glabrous above. SCAPE erect, 2 cm in diameter, glabrous, red (! Duarte); scape-bracts erect, densely imbricate, the lower foliaceous, the upper long-attenuate from an ovate base. INFLORESCENCE bipinnate, subcylindric, ca 8 cm in diameter; primary bracts like the upper scape-bracts, suberect, their blades exceeding the lower branches; racemes divergent or arching from a long erect naked sterile base, to 8 cm long in all, few-flowered; rhachis slender, geniculate, quadrangular, glabrous. FLORAL BRACTS more or less downwardly secund with the flowers, ovate, acute, 2 cm long, about 4 times as long as the internodes, much exceeded by the sepals, carinate, subchartaceous and nerved when dry, glabrous; flowers in part downwardly secund, yellow (! Duarte); pedicels rather slender, 7 mm long. SEPALS elliptic, obtuse, 25 mm long, ecarinate, nerved; petals (old) evidently more than twice as long as the sepals and soon flaccid and drooping; pistil to 6 cm long. Pl. II, fig. 3: Primary bract x 1/2; fig. 4: Branch x 1/2; fig. 5: Sepal x 1.

BRAZIL: MINAS GERAIS: Terrestrial, near Diamantina, 2 February 1965, A. P. Duarte 9017 (HB 35657, type).

118, (174a). V. LANCIFOLIA (Baker) L. B. Smith, Lilloa 6: 386, pl. 2, fig. 3, 4. 1941; Phytologia 13: 122. 1966.

A specimen of the type collection (Blanchet 3458) in the Brussels herbarium shows the flowers distinctly secund. This requires an alternative position in my key next to V. fibrosa L. B. Smith from which it differs in its relatively larger leaf-sheaths, wider and not exactly triangular blades, and smaller sepals.

36a. V. MONSTRUM (Mez) L. B. Smith, comb. nov. Tillandsia monstrum Mez in Fedde Rep. Spec. Nov. 16: 78. 1919. Type: Kalbreyer 1393.

COSTA RICA: CARTAGO: Atlantic rainforest, near Pavones, 9° 56' N, 83° 38' W, alt. 800 m, Horich Vriesea spec. no. 32, cultivated August 1966, J. Marnier-Lapostolle s. n. (US).

Bottled material recieved from J. Marnier-Lapostolle has confirmed my suspicion that this species is a Vriesea. He makes the interesting observation that, even at anthesis, the flower is wholly enclosed in the floral bract.

210a. V. ORJUELAE L. B. Smith, sp. nov. A V. viride (Mez & Wercklé) Sm. & Pitt., cui affinis, foliorum vaginis extus atrocastaneis, ləminis angustioribus, inflorescentia laxa, sepalis angustioribus differt.

PLANT short-caulescent, reproducing vegetatively by basal off-sets, flowering 55 cm high. LEAVES many in a funnellform rosette, 3 dm long, minutely brown-lepidote throughout; sheaths subellip-

tic, 7 cm long, dark castaneous with pale margins and apex; blades narrowly triangular, 2-3 cm wide, flat. SCAPE erect, 4 mm in diameter at apex, glabrous; scape-bracts erect, imbricate, the lower subfoliaceous, the upper broadly elliptic, long-attenuate. INFLORESCENCE known only from a single old specimen, cylindric, laxly bipinnate, 15 cm long, glabrous; primary bracts like the upper scape-bracts, erect to spreading, exceeding the flowers; branches completely aborted with 2 flowers fasciculate in the axil of each primary bract. FLORAL BRACTS incompletely known but evidently broad and about equaling the 7 mm long spreading pedicels. SEPALS elliptic, obtuse, 17 mm long, coriaceous, even. Pl. II, fig. 6: Apex of leaf x 1; fig. 7: Primary bract and branch x 1; fig. 8: Sepal x 1.

COLOMBIA: VALLE: Seacoast, Río Raposo, ca 3° 43' N, 77° 10' W, alt. 3 m, 20 August 1966, Pablo A. Orjuela 290 (US, type; Univ. del Valle, isotype).

143a. V. PEREIRAE L. B. Smith, sp. nov. A V. itatiaiae Wawra, cui affinis, foliis attenuatis, rhachi gracile, bracteis florigeris sepalisque multo angustioribus differt.

PLANT flowering over 1 m high (base unknown). LEAVES presumably rosulate, to 63 cm long, obscurely punctulate-lepidote throughout; sheaths elliptic, 15 cm long, somewhat darkened apically; blades ligulate, attenuate, to 55 mm wide. SCAPE erect, ca 1 cm in diameter, glabrous; scape-bracts densely imbricate, the lower subfoliaceous, the upper ovate, attenuate. INFLORESCENCE bipinnate with ca 16 branches; primary bracts like the upper scape-bracts, erect and imbricate; racemes spreading from a suberect bracteate sterile base, the fertile part to 13 cm long, densely 15-flowered; rhachis geniculate, quadrangular, 2 mm wide. FLORAL BRACTS imbricate, more or less downwardly secund with the flowers, ovate, acute, subcoriaceous, even, glabrous, red (! E. Pereira), drying to castaneous; pedicels 3 mm long, rather slender. SEPALS linear-lanceolate, acute, 28 mm long, the posterior ones with basal keels decurrent on the pedicel; petals ca 35 mm long, about equaling the stamens. Pl. II, fig. 9: Apex of leaf x 1/2; fig. 10: Branch of inflorescence x 1/2; fig. 11: Sepal x 1.

BRAZIL: ESPIRITO SANTO: Castelo, Forno Grande, 6 December 1956, E. Pereira 2235 (RB 96093, type).

6a. V. SAGASTEGUII L. B. Smith, sp. nov. A V. cylindrica L. B. Smith, cui affinis, spicis fere omnibus occultis, bracteis primariis florigerisque densissime lepidotis differt.

PLANT flowering 75 cm high. LEAVES rosulate, 80 cm long, covered with appressed cinereous brown-centered scales; sheaths indistinct; blades very narrowly triangular, 4 cm wide. SCAPE straight, 1 cm in diameter; scape-bracts densely imbricate, broadly elliptic, covered with pale appressed scales, linear-laminate. INFLORESCENCE bipinnate, densely cylindric, 30 cm long 3 cm in diameter; primary bracts like the scape-bracts but merely apiculate, to 7 cm long, covering all but the highest spikes; spikes lanceolate, complanate, densely 7-flowered, 5 cm long

without the naked sterile base, 17 mm wide. FLORAL BRACTS ovate, 25 mm long, covering the sepals, ecarinate, chartaceous, nerved, densely pale-lepidote. SEPALS ovate, 20 mm long, ecarinate, thin-coriaceous, glabrous except at apex; petals tubular-erect, 5-6 cm long; stamens exserted. Pl. II, fig. 12: Spike x 1/2; fig. 13: Sepal x 1.

PERU: CAJAMARCA: Prov. Santa Cruz: On rocks, between Catache and Santa Cruz, alt. 1500 m, 20 May 1965, A. Lopez & A. Sagaste-gui 5175 (US, type; TRP, isotype).

153a. *V. SAXICOLA* L. B. Smith, sp. nov. *A V. cearensis* L. B. Smith, cui affinis, foliorum vaginis atro-castaneis, bracteis florigeris sepalisque multo majoribus differt.

PLANT flowering 125 cm high (! Schwacke). LEAVES 15 or more in a funnelform rosette, 4 dm long, subdensely vestite throughout with minute dark appressed scales; sheaths elliptic, nearly as long as the blades, their lower half dark castaneous; blades ligulate, broadly rounded and apiculate, 45 mm wide, finely purple-spotted. SCAPE erect, 7 mm in diameter near the middle, glabrous; scape-bracts erect, the lower subfoliaceous and densely imbricate, the upper broadly ovate, apiculate, about equaling the internodes. INFLORESCENCE bipinnate, 27 cm long, typically of 4 branches; primary bracts like the upper scape-bracts, shorter than the prophyllate bases of the lateral spikes; spikes subdensely 6-8-flowered, 13-18 cm long, the lateral suberect, the terminal on the end of a scape-like peduncle with several imbricate bracts; rhachis flexuous, 2-3 mm wide, angled. FLORAL BRACTS more or less downwardly secund with the flowers especially on the lateral branches, broadly ovate, minutely cucullate, 23 mm long, nearly or quite twice the internodes, equaling about the middle of the sepals, obtusely if at all carinate, coriaceous, even, whitish (! Schwacke), punctulate-lepidote at apex; pedicels obconic, 6 mm long. SEPALS elliptic, obtuse, 27 mm long; petals white (! Schwacke). Pl. II, fig. 14: Branch of inflorescence x 1/2; fig. 15: Sepal x 1.

BRAZIL: MINAS GERAIS: Serra do Lenheiro, near São João d'El Rei, alt. 900 m, 27 December 1895, Schwacke 12086 (RB 112303, type).

170a. *V. WURDACKII* L. B. Smith, sp. nov. *V. haplostachyae* (C. Wright) L. B. Smith in systemate meo affinis sed foliorum laminis angustissime triangularibus, bracteis sepalisque chartaceis differt.

PLANT known only from fragments over 7 dm long but probably flowering very much higher. LEAVES ca 1 m long, densely and finely brown-lepidote beneath; sheaths ovate, 15 cm long; blades very narrowly triangular, long-attenuate, flat, 35 mm wide. SCAPE straight, 8 mm in diameter, glabrous; scape-bracts erect, closely enfolding the scape, the lower subfoliaceous, the upper ovate, apiculate, slightly exceeding the internodes. INFLORESCENCE simple, ca 25 cm long, glabrous in age; rhachis slender, flexuous, angled. FLORAL BRACTS more or less secund with the

flowers, broadly ovate, acute, 4 cm long, all but the lowest twice as long as the internodes, exceeded by the sepals, ecarnate, chartaceous, nerved. SEPALS oblong-elliptic, obtuse, 33 mm long, 8 mm wide, chartaceous, nerved. Pl. II, fig. 16: Scape and base of inflorescence x 1/2; fig. 17: Sepal x 1.

VENEZUELA: AMAZONAS: Terrestrial, locally frequent in scrub forest on granite dome on right bank of Río Siapa just below Raudal Gallineta (about 110 river km from mouth), alt. 600-700 m, 21 July 1959, Wurdack & Adderley 43569 (US, type; NY, isotype).

Possibly Vriesea wurdackii is more nearly related to V. fibrosa L. B. Smith because of its thin floral bracts and sepals, but it is eliminated earlier in my key because of its imbricate scape-bracts.

Plate I

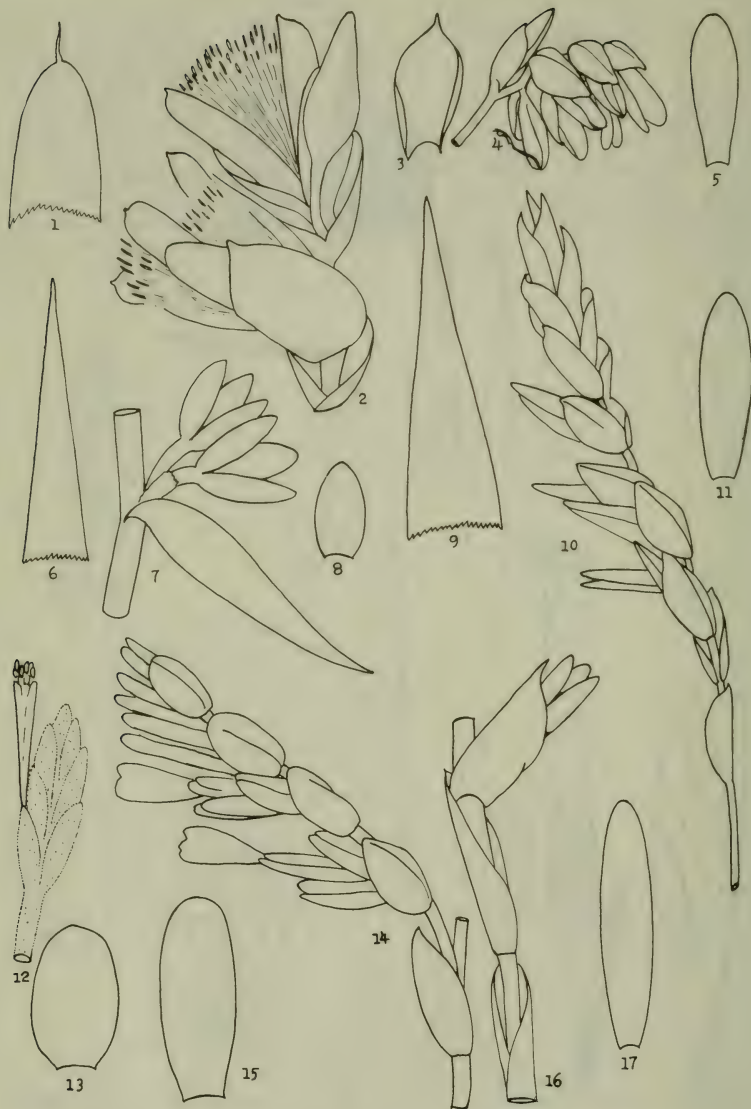
- Fig. 1: *Aechmea castelnavii*.
2 - 4: *Encholirium gracile*.
5, 6: *Greigia ocellata*.
7, 8: *Navia incrassata*.
9, 10: *Navia intermedia*.
11, 12: *Navia lasiantha*.
13, 14: *Orthophytum humile*.
15, 16: *Pitcairnia venezuelana*.
17, 18: *Puya adscendens*.
19, 20: *Tillandsia arenicola*.
21, 22: *Tillandsia calcicola*.
23, 24: *Tillandsia teres*.
25, 26: *Vriesea cacuminis*.

Plate I



See opposite page for explanation.

Plate II



Figs. 1, 2: *Vriesea dodsonii*. 3-5: *V. duarteana*.
 6-8: *V. orjuelae*. 9-11: *V. pereirae*.
 12, 13: *V. sagasteguii*. 14, 15: *V. saxicola*.
 16, 17: *V. wurdackii*.

ADDITIONAL NOTES ON THE GENUS VERBENA. VI

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional bibliography: Bonstedt, Pareys Blumengärtn., ed. 1, 273--277. 1932; Potztal in Encke, Pareys Blumengärtn., ed. 2, 2: 439. 1960; Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 439--442. 1960; F. A. Barkley, List Ord. Fam. Anthoph. 75, 76, 163, 171, & 219. 1965; S. V. Ramaswami, Study Flow. Pl. Bangalore [thesis] 1018, 1019, & 1466. 1966; Rickett, Wild Fls. U. S. 2 (2): 461--465, 471, & 685--686. 1967; Lehr, Bull. Torrey Bot. Club 94: 544. 1967; Moldenke, Phytologia 15: 466, 468, & 478--495 (1968) and 16: 48--56. 1968; Anon., Plants for Seashore [2]. n.d.

Barkley (1965) includes Helleranthus among the valid genera of Verbenaceae.

VERBENA BIPINATIFIDA Nutt.

Additional bibliography: Rickett, Wild Fls. U. S. 2 (2): 462, 463, & 685, pl. 170. 1967; Moldenke, Phytologia 15: 486--487 (1968) and 16: 48. 1968.

Additional illustrations: Rickett, Wild Fls. U. S. 2 (2): pl. 170 [in color]. 1967.

VERBENA BRACTEATA Lag. & Rodr.

Additional bibliography: Rickett, Wild Fls. U. S. 2 (2): 462, 463, & 685, pl. 170. 1967; Moldenke, Phytologia 15: 488--490 & 493 (1968) and 16: 50. 1968.

Additional illustrations: Rickett, Wild Fls. U. S. 2 (2): pl. 170 [in color]. 1967.

Mason (1957) tells us that this species is "common near water in marshes and floodlands of valleys and foothills throughout California". Macoun (1884) describes it as growing "On dry prairies apparently very rare. Collected on the high prairie north of the Saskatchewan near the forks of the Red Deer and Saskatchewan rivers. August 8th, 1879. (David Macoun.)"

VERBENA BRASILIENSIS Vell.

Additional bibliography: Rickett, Wild Fls. U. S. 2 (2): 462, 463, & 685, pl. 170. 1967; Moldenke, Phytologia 15: 490--491. 1968.

Additional illustrations: Rickett, Wild Fls. U. S. 2 (2): pl. 170 [in color]. 1967.

The color illustration labeled as Verbena "littoralis" by Rickett (1967) is actually a picture of V. brasiliensis Vell.

VERBENA CANADENSIS (L.) Britton

Additional & emended synonymy: Verbena aubletia var. drummondii Lindl. ex Bonstedt, Pareys Blumengärtn., ed. 1, 2: 273. 1932.

Verbena canadensis cv. "Drummondii" Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 440. 1960. *Verbena canadensis* cv. "Compacta" Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 440. 1960.

Additional bibliography: Bonstedt, Pareys Blumengärtn., ed. 1, 2: 273. 1932; Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 440. 1960; Rickett, Wild Fls. U. S. 2 (2): 462, 463, & 685, pl. 170. 1967; Moldenke, Phytologia 15: 492--493 (1968) and 16: 52. 1968.

Additional illustrations: Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 440. 1960; Rickett, Wild Fls. U. S. 2 (2): pl. 170 [in color]. 1967.

Bonstedt (1932) records the German common name, "aubletien Eisenkraut", for this plant. Maatsch (1960) states that the species was introduced into cultivation in 1774, and cites as an illustration "B. C. 3: 3447", referring, apparently, to L. H. Bailey's Cyclopaedia. He describes two cultivars as follows: "cv. 'Drummondii'. Krone 2 cm breit, mit weichhaariger Röhre, schwachwohlriechend, lila-blau. -- B. R. 10: 1925; wichtig cv. 'Compacta'. Blüten karminrosa. Pflanzen 40 cm hoch, dicht buschig, reichblühend." He gives as cultural notes for the species: "Dieser Art ist wegen ihrer Reichblütigkeit, langen Blütezeit und Genügsamkeit in bezug auf den Boden für grössere und kleinere Anlagen gleich zu empfehlen, auch für grössere Flächen gut geeignet. Anzucht und Kultur wie bei voriger."

VERBENA CANESCENS H.B.K.

Additional bibliography: Rickett, Wild Fls. U. S. 2 (2): 464 & 685. 1967; Moldenke, Phytologia 15: 490 & 493--494. 1968.

VERBENA CAROLINA L.

Additional bibliography: Moldenke, Phytologia 15: 494--495 (1968) and 16: 48. 1968.

VERBENA CAROLINA f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 15: 495 (1968) and 16: 48. 1968.

VERBENA CHILENSIS Moldenke

Additional bibliography: Moldenke, Phytologia 13: 188--189 (1966) and 16: 53. 1968.

VERBENA CILIATA Benth.

Additional bibliography: Rickett, Wild Fls. U. S. 2 (2): 462 & 685. 1967; Moldenke, Phytologia 15: 484 (1968) and 16: 48--49 & 54. 1968.

VERBENA CILIATA var. LONGIDENTATA Perry

Additional bibliography: Moldenke, Phytologia 15: 486 (1968) and 16: 48--49. 1968.

VERBENA CILIATA var. PUBERA (Greene) Perry

Additional bibliography: Moldenke, Phytologia 15: 486 (1968)

and 16: 49. 1968.

VERBENA CLOVERAE Moldenke

Additional bibliography: Rickett, Wild Fls. U. S. 2 (2): 464 & 685. 1967; Moldenke, Phytologia 16: 49. 1968.

xVERBENA CORRUPTA Moldenke

Additional synonymy: Verbena phlogiflora x chamaedryfolia Bonstedt, Pareys Blumengärtn., ed. 1, 2: 274. 1932.

Additional bibliography: Bonstedt, Pareys Blumengärtn., ed. 1, 2: 274. 1932; Moldenke, Phytologia 11: 454. 1965.

According to Bonstedt (1932) and other horticulturists, this hybrid is the wellknown cultivar known in the trade as "Defiance".

VERBENA DELTICOLA Small

Additional bibliography: Moldenke, Phytologia 15: 493 (1968) and 16: 51. 1968.

VERBENA HALEI Small

Additional bibliography: Rickett, Wild Fls. U. S. 2 (2): 464 & 685. 1967; Moldenke, Phytologia 16: 56. 1968.

VERBENA HASTATA L.

Additional & emended bibliography: Holmgren & Reveal, U. S. Forest Serv. Res. Paper INT.32: [Checklist Vasc. Fl. Intermont. Reg.] 91. 1966; Rickett, Wild Fls. U. S. 2 (2): 464, 465, & 686, pl. 171. 1967; Cody, Ind. Sem. 1967: 18. 1967; Shinn, Univ. Kans. Sci. Bull. 46: 790, 886, 887, & 928. 1967; Moldenke, Phytologia 14: 277, 284--285, 298, & 300. 1967; Moldenke, Résumé Suppl. 15: 1 & 2. 1967; C. L. Porter, Tax. Flow. Pl., ed. 2, 394 & 395, fig. 348. 1967; Moldenke, Phytologia 16: 50 & 56. 1968.

Additional illustrations: Bischoff, Handb. Bot. Term. 1: pl. 22, fig. 651. 1830; G. H. Buek, Wild Fls. Am. 1 (1): pl. 9 [in color]. 1894; Martin & Bradley, Seed Ident. Man. fig. 235 & 260. 1961; Marie-Victorin, Fl. Laurent., ed. 2, fig. 170. 1964; C. L. Porter, Tax. Flow. Pl., ed. 2, 395, fig. 348. 1967; Rickett, Wild Fls. U. S. 2 (2): pl. 171 [in color]. 1967.

Fernald refers to this species as "rare" in Aroostook County, Maine. Fowler (1878, 1885) says that it grows in waste ground, but is not common, in New Brunswick; he cites Fowler s.n. from Kouchibouguac, Hay s.n. from Norton and Tobique, and Wetmore s.n. from Andover and Saint George. Macoun (1884) says "Chiefly in waste grounds and in low pastures along streams. Common from Nova Scotia, New Brunswick and Quebec westward throughout Ontario to the Sault Ste. Marie. (Macoun.) Rainy River, Ont. (Dawson.) Abundant on Lake Winnipeg. (J. M. Macoun.) Canada to the Saskatchewan. (Richardson.) Low alluvial soils Northwest coast (Douglas.) Spellimacheen, B. C. (Hill.)" Carleton (1959) records the additional common name, "blue American vervain", for this species.

Mason (1957) tells us that the species often forms large con-

spicuous colonies in wet land of the Central Valley of California, and the Sierra Nevada foothills to eastern Shasta County [I suspect that this is var. scabra to which he here refers].

Shinn (1967) records the fact that the females of the bees, Calliopsis [Verbenapis] andreniformis and C. nebraskensis, gather pollen from the flowers of this species.

Wunderlin (1966) records Verbena hastata from Carroll County, Illinois; Hartley (1966) says that it grows on shores, in marshy moist meadows, and in low pastures, "common throughout the Driftless Area". Mohlenbrock & Voigt (1965) cite Mohlenbrock 12418 from Illinois. Boivin (1966) records the species from British Columbia. Seed from which the Wagenitz collection, cited below, was grown was obtained originally from a French garden.

On page 23 of the Bischoff (1849) reference in the bibliography of this species the figure number is given as "561" in error.

Due to some apparently unintentional clerical error, material of this species has been distributed in certain herbaria under the name Viola hastata L. On the other hand, the W. Deane s.n. [Aug. 10, 1890], distributed as Verbena hastata, is actually xV. engelmannii Moldenke, while W. D. Forbes 143 is V. urticifolia L.

Additional citations: ONTARIO: Bruce Co.: W. R. Watson 3004 (Ws). MAINE: Aroostock Co.: Fernald s.n. [St. Francis, Aug. 5, 1893] (Ms--80933). Piscataquis Co.: Fernald 296 (Ms--80932). NEW HAMPSHIRE: Coös Co.: W. Deane s.n. [July 16, 1920] (Ms--80931); Pease 24195 (Ms--77560). VERMONT: Rutland Co.: Goodale s.n. [29 August 1925] (Ms--30789), s.n. [5 Aug. 1926] (Ms--48539), s.n. [6 Aug. 1926] (Ms--48538). MASSACHUSETTS: Barnstable Co.: Elwell s.n. [Aug. 24, 1891] (Ms--50457); Goodale s.n. [11 Aug. 1934] (Ms--77596). Franklin Co.: Goodale & Markert s.n. [11 Aug. 1930] (Ms--59634); Goodale, Markert, & Piper s.n. [27 July 1929] (Ms--55637); Markert s.n. [27 Aug. 1931] (Ms--64869). Hampden Co.: Dorwart s.n. [18 July 1932] (Ms--68337); Goodale & Markert s.n. [25 July 1930] (Ms--59631); Markert s.n. [12 Aug. 1930] (Ms--59633); F. C. Seymour 511 (Ms--51406). Hampshire Co.: Elwell s.n. [July 5, 1889] (Ms--50456); Goodale s.n. [31 July 1926] (Ms--48451), s.n. [July 27, 1927] (Ms--51830), s.n. [22 August 1928] (Ms--53967); Goodale & Markert s.n. [8 July 1930] (Ms--59629), s. n. [25 July 1930] (Ms--59630); Goodale, Markert, & Piper s.n. [13 July 1929] (Ms--55712), s.n. [18 July 1929] (Ms--55640), s.n. [27 July 1929] (Ms--55636); Goodale, Potsubay, & Saint John s.n. [21 August 1931] (Ms--64874); R. N. Hosford s.n. [July-August 1932] (Ms--69431); Markert s.n. [9 July 1930] (Ms--59628); Potsubay s.n. [6 July 1932] (Ms--69095), s.n. [25 July 1932] (Ms--69087); C. H. K. Sanderson 1956 (Ms--72456). Middlesex Co.: W. Deane s.n. [Cambridge, Sept. 4, 1883] (Ms--80928). Worcester Co.: Goodale & Markert s.n. [12 Aug. 1930] (Ms--59632); Goodale, Markert, & Piper

s.n. [2 Aug. 1929] (Ms--55639); Goodale, Potsubay, & Saint John s.n. [31 July 1931] (Ms--64871), s.n. [10 Aug. 1931] (Ms--64872, Ms--64873); R. H. Piper s.n. [11 September 1928] (Ms--54546), s.n. [12 Aug. 1929] (Ms--55638), s.n. [21 July 1930] (Ms--59627), s.n. [2 August 1931] (Ms--64870). CONNECTICUT: Hartford Co.: Ahles 65293 (Ms--51737). NEW YORK: Dutchess Co.: Ahles 64431 (Ms--51384); Poppey s.n. [Aug. 3rd, '74] (Ms--58352). Suffolk Co.: M. Hopkins s.n. [17 Aug. 1929] (Ms--57735). PENNSYLVANIA: Philadelphia Co.: E. Durand s.n. [near Philad.] (Ms--30790). VIRGINIA: Smyth Co.: J. K. Small s.n. [July 30, 1892] (Ms--30791). ILLINOIS: Tazewell Co.: V. H. Chase 3229 (Du--367171). SOUTH DAKOTA: Lawrence Co.: F. L. Bennett 1093, in part (Du--347239). CULTIVATED: Germany: Wagenitz s.n. [Mus. Bot. Berol. Gartenherb. W.382] (Rf.).

VERBENA HASTATA f. ALBIFLORA Moldenke

Additional synonymy: Verbena hastata var. alba Bergmans ex L. H. Bailey, Man. Cult. Pl., ed. 2, 840 & 1113. 1949.

Additional bibliography: L. H. Bailey, Man. Cult. Pl., ed. 2, 840 & 1113. 1949; Moldenke, Phytologia 11: 465. 1965; Moldenke, Résumé Suppl. 15: 24. 1967.

VERBENA HASTATA var. SCABRA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 200. 1966.

Additional citations: IDAHO: Owyhee Co.: J. M. Johnson 254 (Du--458528). WASHINGTON: Yakima Co.: Kruckeberg 2545 (Ms--34293).

VERBENA HERTERI Moldenke

Additional bibliography: Moldenke, Phytologia 13: 249. 1966.

Additional citations: URUGUAY: Herter 979 [Herb. Herter 82378] (Ws--isotype).

VERBENA HIRTA Spreng.

Additional bibliography: Moldenke, Phytologia 14: 285. 1967.

The Rambo 56783, distributed as V. hirta, is actually V. rigida Spreng.

Additional citations: BRAZIL: Paraná: L. S. Smith Bras.63a (Ac).

VERBENA HIRTA var. GRACILIS Dusén

Additional bibliography: Moldenke, Phytologia 14: 285. 1967.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo 51940 (B).

VERBENA HISPIDA Ruiz & Pav.

Additional & emended bibliography: Moris, Ann. Stor. Nat. 4: 39 & 59--60. 1830; Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: 408. 1881; H. Fischer, Beitr. Vergl. Morphol. Pollenk. 46. 1890; Anon.,

U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Meyer & Weyrauch, *Guia Excurs. Biol. Tucum.* 64 & 123. 1966; Moldenke, *Phytologia* 14: 285--286. 1967.

The flowers on R. F. Steinbach 84 are described as "flor violeta vivo base exterior púrpura rojiso".

Additional citations: BOLIVIA: Cochabamba: R. F. Steinbach 84 (Ws). CULTIVATED: Germany: Wagenitz s.n. [Mus. Bot. Berol. Gartenherb. W.383] (Rf).

VERBENA HOOKERIANA (Covas & Schnack) Moldenke

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Moldenke, *Phytologia* 14: 286. 1967.

Additional citations: ARGENTINA: Catamarca: Brizuela 978 (Ms--34297).

VERBENA HUMIFUSA Cham.

Additional bibliography: Moldenke, *Phytologia* 13: 250. 1966.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo 48804 (B), 49013 (B), 51272 (B), 57298 (B).

xVERBENA HYBRIDA Voss

Additional bibliography: Lem. & Chauv., *Traité Cult. Geran.* 1--152. 1842; Lecoq, *Ann. Scient. Litt. & Indust. Auverg.* 25: 145--157. 1852; E. S. Rand, *Trans. Mass. Hort. Soc.* 1859: 42--49. 1860; Chaté, *Des Verv.* 1--63. 1865; Duthie, *Fl. Upper Gang. Plain* 2: 218. 1911; L. H. Bailey, *Man. Cult. Pl.*, ed. 1, pr. 1, 628, 629, & 848 (1924), pr. 2, 628, 629, & 848. 1925; McCallan, *Flow. Gard. Calend.* 18. 1927; Bonstedt, *Pareys Blumengärt.*, ed. 1, 2: 273--274. 1932; I. N. Anderson, *Nat. Hort. Mag.* 12: 72. 1933; Emsweller & Blodgett, *Proc. Amer. Soc. Hort. Sci.* 35: 822--824. 1938; L. H. Bailey, *Man. Cult. Pl.*, ed. 1, pr. 3, 628, 629, & 848 (1938), pr. 4, 628, 629, & 848 (1944), and ed. 2, 840, 841, & 1113. 1949; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Karrer, *Konstit. & Vork. Organ. Pflanzenst.* 684. 1958; Maatsch in Encke, *Pareys Blumengärt.*, ed. 2, 2: 440--441 & opp. 352. 1960; Ohwi, *Fl. Jap.* 763. 1965; Sorin, *Jard. France* [Bull. Soc. Nat. Hortic. France] 1966: 105--107. 1966; J. G. Barton in Novák, *Pict. Encycl. Pl. & Fls.* 403, fig. 801. 1966; Schwanitz, *Orig. Cult. Pl.* 92. 1966; Berrall, *Garden* 44, 279, & 326. 1966; Queen, *Madman Theory* 134. 1966; Behm, *Fl. Um Uns* 50, 51, & 287. 1966; Pop, *Bot. Gard. Cluj* 12. 1966; M. Raymond, *Ann. Résult. Jard. d'Essai Jard. Bot. Montreal* 1965: 85 (1966) and 1966: 61 & 70. 1967; Rickett, *Wild Fls. U. S.* 2 (2): 462 & 686. 1967; Moldenke, *Phytologia* 14: 286 & 293. 1967; Schling, *Seedsman Cat.* Spring 1967 Anniv. Ed. 20. 1967; Anon., *Country Shopper* 7 (7): 14. 1967; Moldenke, *Résumé Suppl.* 15: 15. 1967; J. F. Williamson, *Sunset West. Gard. Book*, new ed., 437. 1967; Anon., *Rutgers Univ. Dept. Hort. & Forest. Veget.-Flow. Open House F.4.* 1967; Zukowski, *Fl. Polska* 11: 65. 1967.

Additional illustrations: Chaté, *Des Verv.* front. pl. 1865; Bonstedt, *Pareys Blumengärt.*, ed. 1, 2: 274 & opp. 274 [in color].

1932; Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: opp 352 [in color]. 1960; Sorin, Jard. France [Bull. Soc. Nat. Hortic. France] 1966: 106 & 107. 1966; J. G. Barton in Novák, Pict. Encycl. Pl. & Fls. fog. 801. 1966.

Ohwi (1965) records the Japanese common name "bijozakura" for this plant. According to "The Country Shopper" (1967) the "White Verbena" form of this taxon indicates "pray for me in my absence" in the so-called "language and sentiment of flowers".

Williamson (1967) lists the horticultural varieties "Amethyst", with sky-blue flowers, and "Miss Susie", with double salmon-pink flowers. Under V. peruviana -- but probably in error -- he lists "Cherry Pink" and "Princess Gloria", both with salmon-toned flowers, and says that the two latter, along with "Appleblossom", are especially common in southern California gardens and in desert areas. Raymond (1966, 1967) lists as cultivated in Montreal the following additional cultivars: "Bannière Suisse", "Compact", "Olympiamischung", "Royal Blue White-eye", "Scarlet", and "Torrid". The plant is referred to by Duthie (1911) as V. chamaedryfolia Juss. According to Zukowski (1967) it is both cultivated and escaped in Poland.

Additional German common names for this plant are "aurikelblütigen Verbenen", "Blumisten-Eisenkraut", and "Garten-Eisenkraut". According to Maatsch (1960) and other horticulturists, the cultivar known as "Defiance" is actually the simple hybrid between V. peruviana and V. phlogiflora which I have designated as xV. corrupta Moldenke. These authorities also maintain that the "aurikelblütigen Verbenen" [V. hybrida var. auriculiflora Hort., etc.] represent a straight hybrid between V. phlogiflora and V. platensis.

Maatsch (1960) gives the following interesting account of this plant: "V. x hybrida Voss. Garten-Verbene. Juli--September. Aus Kreuzungen verschiedener Arten sind unsere heutigen Gartenverbenen hervorgegangen. Zu den Stammeltern werden gerechnet: V. peruviana, die die roten Farben brachte, V. phlogiflora und V. incisa, die rosa-purpurfarbene Töne lieferten, und die weisse V. platensis, die wohl den Duft einbrachte. Die Verbindung von V. peruviana x phlogiflora brachte mit der Sorte 'Défiance' das Scharlachrot ins Sortiment; V. phlogiflora x platensis brachte das weisse Auge der 'aurikelblütigen' Verbenen. Diese Hybriden sind ihrer Herkunft nach staudig-halbstrauchig, werden aber in Kultur heute kaum anders als einjährig aus Samen gezogen. Als in früheren Jahrzehnten die Durchzüchtung noch zu wünschen übrig liess, wurden ausgesuchte Mutterpflanzen durch Stecklinge vermehrt, wie es etwa heute bei Ageratum noch geschieht. Dem Wuchs nach sind bis 45 cm hoch wachsende Sorten der Hybrida- und Mammut-Klasse von den niedrigen der Compacta-Klasse oder den amerikanischen Buschverbenen zu unterscheiden, die etwa 20--25 cm erreichen. Der Wuchs ist bei den hohen Sorten mehr aufrecht, bei den niedrigen niederliegend-aufstrebend. Die Pflanzen sind mehr oder weniger mit ziemlich steifen, grauen Haaren

besetzt. Die Blätter sind gestielt, länglich oder eiförmig-länglich, stumpf, gezähnt oder am Grunde gelappt. Die Blüten erscheinen in reich blühenden, doldenartigen, dichten Ähren in der verschiedensten Farben von Weiss über Rosa und Lachs zu Scharlachrot und Blau, mit oder ohne Auge. -- B. C. 3: 3446; Parey I. 2: 274 (farbig). (K) Mit *Phlox drummondii* gehören die Verbenen zu den wertvollsten Sommerblumen für flächige Pflanzungen, für die sie unentbehrlich sind. Leichte Kultur, Anspruchslosigkeit und langanhaltende, reiche Blüte zeichnen sie aus. Der Standort soll möglichst sonnig sein, schon in leichtem Schatten lässt die Blüte nach. Im Laufe des Sommers empfiehlt es sich, durch flüssige Nachdüngung oder Kopfdüngung mit Volldünger die für reiche Blüte notwendige Ernährung zu sichern. Anzucht aus Samen, entweder ab März unter Glas, dann in kleine Töpfe (Torftöpfe) pikierten und temperiert, später im Kasten hell kultivieren, um im Mai blühende kleine Topfpflanzen für den Verkauf bereit zu haben, oder Aussaat im April in den Kasten und direkt von hier auspflanzen, dann ist jedoch die Blüte entsprechend erst ab Juli zu erwarten. 1 g Samen enthält etwa 350 Korn, auch hier verläuft die Keimung so unregelmässig wie bei den Arten nach etwa 2—3 Wochen. Das Saatgut bleibt nur 2 Jahre keimfähig."

Additional citations: CULTIVATED: New York: H. N. Moldenke 24323 (Ac).

xVERBENA ILLICITA Moldenke

Additional bibliography: Moldenke, *Phytologia* 14: 286. 1967; Moldenke, *Résumé Suppl.* 15: 1. 1967; Rickett, *Wild Fls. U. S.* 2 (2): 464. 1967.

Additional citations: ILLINOIS: County undetermined: Eggert s.n. [Mississippi Valley in Ills., 14 August 1875] (Ms--30843, Ms--30844).

VERBENA INCISA Hook.

Additional bibliography: L. H. Bailey, *Man. Cult. Pl.*, ed. 1, pr. 1, 628, 629, & 848 (1924) and pr. 2, 628, 629, & 848. 1925; Bonstedt, *Pareys Blumengärtn.*, ed. 1, 2: 274. 1932; L. H. Bailey, *Man. Cult. Pl.*, ed. 1, pr. 3, 628, 629, & 848 (1938) and pr. 4, 628, 629, & 848. 1944; Maatsch in Encke, *Pareys Blumengärtn.*, ed. 2, 2: 440 & 441. 1960; Moldenke, *Phytologia* 13: 250. 1966.

Woolston describes this plant as an erect or decumbent herb, 30--60 cm. tall, with scarlet flowers, growing in cultivated ground, and called "ivoti-la-novia". Maatsch (1960) describes it as follows: "Südbrasilien, Paraguay, Nordargentinien. Sommer bis Herbst. Ähnlich *V. peruviana* und *V. phlogiflora*, aber mit viel tiefer eingeschnittenen Blättern. Ganze Pflanze haarig-flaumig. Stengel aufsteigend. Äste aufrecht. Doldenköpfchen flach. Kelch 1mal so lang wie die Deckblätter, kurz behaart. Kronröhre 3mal so lang wie der Kelch. Kronsaum gross, rosa-purpurn, unterseits heller, Abschnitte verkehrt-eiförmig, tief ausgerandet. -- 1826. B. M. 3628; B. C. 3: 3445."

Additional citations: PARAGUAY: Woolston 731 (S). ARGENTINA:

Catamarca: Rodriguez Vaquero 907 (Ms--34333). Chaco: Aguilar 844 (Du--411423). Formosa: I. Morel 419 (Ms--34302). Tucumán: Monetti s.n. [Herb. Inst. Miguel Lillo 31354] (Du--317603).

VERBENA INTEGRIFOLIA Sessé & Moc.

Additional bibliography: Moldenke, *Phytologia* 11: 468. 1965; Moldenke, *Résumé Suppl.* 15: 3. 1967.

Additional citations: MEXICO: Guanajuato: A. R. Moldenke 1812 (Rf). Michoacán: A. R. Moldenke 1751 (Ac), 1762 (Rf). Nayarit: A. R. Moldenke 1643 (Rf).

VERBENA INTEGRIFOLIA f. ALBIFLORA Moldenke, *Résumé Suppl.* 15: 3, nom. nud. (1967), f. nov.

Haec forma a forma typica speciei corollis albis recedit.

This form differs from the typical form of the species in having white corollas.

The type of the form was collected by Andrew Ralph Moldenke (no. 1750) eighteen miles east of Zamora, Michoacán, Mexico, on June 20, 1967, and is deposited in my personal herbarium at Plainfield, New Jersey.

Citations: MEXICO: Michoacán: A. R. Moldenke 1750 (Z--type).

VERBENA INTERMEDIA Gill. & Hook.

Additional bibliography: Hieron., *Bol. Acad. Nac. Cienc. Córdoba* 4: 405. 1881; Lorentz & Niederlein, *Bot. Exoed. Rio Negro* 264. 1881; Anon., *U. S. Dept. Agr. Bot. Subj. Index* 15: 14361. 1958; Moldenke, *Phytologia* 14: 287. 1967.

VERBENA JORDANENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 204. 1966.

This plant has been collected in anthesis and fruit in November and December.

Material has been misidentified and distributed in herbaria by Rambo under the names "Timitocia chamaedryfolia (Cham.) Mold." and Timotocia chamaedryfolia (Cham.) Moldenke.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo 49436 (B), 54015 (B), 54533 (B).

VERBENA LACINIATA (L.) Briq.

Additional synonymy: Verbena pulcherrima Hort. ex Bonstedt, Pareys *Blumergärtn.*, ed. 1, 2: 273, in syn. 1932.

Additional bibliography: Hieron., *Bol. Acad. Nac. Cienc. Córdoba* 4: [Sert. Sanjuan.] 68 (1881) and 4: 409. 1881; Lorentz & Niederlein, *Bot. Exped. Rio Negro* 266. 1881; H. Fischer, *Beitr. Vergl. Morphol. Pollenk.* 46--47. 1890; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 1: 877 (1893) and 2: 895, 1178, & 1179 1895; Bonstedt, Pareys *Blumergärtn.*, ed. 1, 2: 273. 1932; Anon., *Ind. Sem. Of. Canje Jard. Bot. Montev.* 8. 1935; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 2, 1: 877 (1946) and 2: 895, 1178, & 1179 (1946) and pr. 3, 1: 877 (1960) and 2: 895, 1178, & 1179.

1960; Solbrig, Biol. Abstr. 47: 2870. 1966; Moldenke, Phytologia 14: 287 (1967) and 16: 48. 1968.

Bonstedt (1932) lists Verbena selloi Spreng. and V. geranii-folia Hort. as synonyms of this species. The former, however, is a valid species and the latter is a synonym of V. tenera Spreng. He also records the German common name "leberbalsamartiges Eisenkraut". It should be noted here that the Verbena selloi Spreng., Shuttleworthia selloi (Spreng.) Walp., Shuttleworthia selloi Walp., Shuttleworthia selloi Walp., and Schuttleworthia selloi Walp., included by me in the synonymy of Verbena laciniata in Phytologia 9: 389 (1963) should be deleted, as they all belong with the separate valid species V. selloi Spreng., which see.

The Herter 181a, misidentified and distributed as V. laciniata, is actually V. selloi Spreng.

VERBENA LASIOSTACHYS Link

Additional synonymy: Verbena prostrata Jepson ex H. L. Mason, Fl. Marshes Calif. 677, in syn. 1957.

Additional & emended bibliography: A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 336 (1878) and ed. 2, 2 (1): 336. 1886; P. B. Kennedy, Annot. List Wild Fls. Calif. 112. 1917; Perry, Rhodora 38: 271-272. 1936; H. L. Mason, Fl. Marshes Calif. 677. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Moldenke, Phytologia 13: 251 (1966) and 14: 287. 1967; Moldenke, Résumé Suppl. 15: 2 & 15. 1967.

The L. S. Smith 2814 and DeWolf 802, distributed as typical V. lasiostachys, appear instead to represent var. septentrionalis Moldenke; I. L. Wiggins 1763 is V. robusta Greene; and R. F. Hoover 3812 is a mixture of var. scabrida Moldenke and V. abramsii Moldenke. The corollas on J. H. Thomas 3532 are said to have been "light-blue", while on his no. 10428 they were "lavender-purple". This collector found the plant growing in coastal scrub along with Achillea millefolium, Baccharis pilularis, Rubus ursinus, Scrophularia californica, Eriophyllum staechadifolium, Horkelia californica, Salix sp., and Lonicera involucrata. Its specific name is sometimes uppercased.

Mason (1957) states that the species is "very common throughout California", while Kennedy (1917) says it is found only "throughout the west and south" of the state.

Additional citations: CALIFORNIA: Monterey Co.: H. N. Moldenke 24270 (Rf). San Mateo Co.: J. H. Thomas 10428 (Du--512495). Santa Cruz Co.: J. H. Thomas 3532 (Du--385227).

VERBENA LASIOSTACHYS var. SCABRIDA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 287. 1967.

R. F. Hoover 3812 appears to be a mixture with V. abramsii Moldenke.

VERBENA LASIOSTACHYS var. SEPTENTRIONALIS Moldenke

Additional bibliography: Moldenke, Phytologia 14: 287. 1967; Moldenke, Résumé Suppl. 15: 2 & 15. 1967.

Recent collectors have found this plant growing in meadows, at the edges of grassy springs on the sides of hills, and in dry open ground associated with Hypericum perforatum and Aira caryophyllea. The corollas are described as "blue" on Breedlove 4164 and on J. H. Thomas 2470, 3219, 4365, & 8132, and as "purple" on Dennis & Dennis 2255.

Additional citations: OREGON: Jackson Co.: Dennis & Dennis 2255 (Du--458541). CALIFORNIA: Los Angeles Co.: Granert s.n. [June 23, 1965] (Ac, Ws). Monterey Co.: Durham s.n. [Sept. 5, 1942] (Du--308962); Plaskett 142 (Ms--30815). Placer Co.: L. S. Smith 2814 (Du--312449). San Luis Obispo Co.: Nobs & Smith 868, in part (Du--415536, Du--415605). San Mateo Co.: Overlander 197 (Du--371701). Santa Barbara Co.: Breedlove 4164 (Du--500660); DeWolf 802 (Ms--34323, Ms--34324). Santa Clara Co.: J. H. Thomas 4365 (Du--385228), 8132 (Du--418410). Santa Cruz Co.: J. H. Thomas 2470 (Du--415675), 3219 (Du--415704), 3290 (Du--388809). Sonoma Co.: A. A. Heller 5785 (Ms--30812). Tehama Co.: Munz 16963 (Du--366541). CULTIVATED: Germany: Herb. F. J. Young s.n. (Ws).

VERBENA LILACINA Greene

Additional bibliography: Moldenke, Phytologia 14: 287. 1967.

Moran describes this plant as a bushy herb, 1 m. tall, or rounded shrub, rather scarce in arroyos, at 50 to 1100 meters altitude. The corollas are described as "lavender" on Moran 8195 & 10669.

Additional citations: MEXICO: Baja California: R. V. Moran 8195 (Du--502192). CEDROS ISLAND: R. V. Moran 10669 (Du--498467), 10698 (Du--498463).

VERBENA LINDMANII Briq.

Additional bibliography: Moldenke, Phytologia 14: 287. 1967.

Additional citations: BRAZIL: Rio Grande do Sul: O. Camargo 2683 [Herb. Anchieta 61584] (B); Rambo 40398 (B), 57071 (B).

VERBENA LITORALIS H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223, pl. 137. 1817.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223, pl. 137 (1817), ed. quart., 2: pl. 137 (1817), and ed. quart., 2: 276. 1818; Hook. f., Trans. Linn. Soc. Lond. Bot. 20: 195. 1847; N. J. Anderss., Vet. Akad. Handl. Stockh. 1853: 200. 1854; N. J. Anderss., Galap. Veg. 81. 1859; Hieron., Bol. Acad. Nat. Cienc. Córdoba 4: 408. 1881; Robinson & Greerm., Am. Journ. Sci. 150 [ser. 3, 50]: 147. 1895; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; B. L. Robinson, Proc. Am. Acad. 38:

197. 1902; H. L. Mason, Fl. Marshes Calif. 676. 1957; H. St. John, Nomencl. Fl. 70. 1958; Meyer & Weyrauch, Guia Excurs. Biol. Tucum. 64 & 123. 1966; Shinners, Sida 2: 393 & 448. 1966; Reese & Thieret, Castanea 31: 274. 1966; Moldenke, Résumé Suppl. 15: 2-5 & 24. 1967; Moldenke, Phytologia 14: 287-288, 292, & 293 (1967), 15: 486 (1968), and 16: 53. 1968.

Additional & emended illustrations: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: pl. 137 [in color] (1817) and ed. quart., pl. 137. 1817.

The dates for the H.B.K. references given above are taken from the researches of Barnhart (1902). The color illustration labeled V. "littoralis" by Rickett (1967) is actually V. brasiliensis Vell.

Breedlove found this species growing on slopes and steep slopes with Quercus in Chiapas. Reese & Thieret (1966) record it from the Five Islands of Louisiana. Solbrig, Moore, & Walker found it to be "common in overgrazed areas" on Masafuera. The Andrew Moldenkes state that it is an "abundant weed in agricultural areas" in San Luis Potosí.

The corollas are described as "blue" on Belshaw 3054, Breedlove 10855 & 12184, and Moldenke & Moldenke 2262, "purplish-blue" on Wiggins & Porter 423, and "lavender-purple" on J. T. Howell 8882.

The Venturi 2814, distributed as V. littoralis, is actually V. bonariensis L.; O'Donell 95 [Herb. Inst. Miguel Lillo 36218] is V. brasiliensis Vell.; Rambo, Herb. Anchieta 45339 is V. minutiflora Briq. [not V. montevidensis Spreng., as previously reported]; O. Camargo 621 & 959, Herb. Anchieta 59429, 60406, & 60703, and Machado s.n. are V. montevidensis Spreng., while C. R. Orcutt s.n. [Mts., Northern Lower California, 7-8-1885] is V. neomexicana (A. Gray) Small. The Schimpff 132, cited below, was previously cited as V. glabrata H.B.K. in error.

It is possible that Bentham's var. glabrior belongs in the synonymy of V. glabrata H.B.K. Robinson (1902) gives 1817 as the original date of publication of the name, Verbena littoralis, and in this, according to Barnhart (1902), he seems to be correct if the folio edition of the work is cited, not the quarto edition. Robinson also cites the following specimens not as yet seen by me: GALAPAGOS ISLANDS: Charles: Baur 172 (G); C. Darwin s.n.. Chatham: N. J. Andersson s.n. (G).

The H. H. Rusby 911, cited as V. littoralis in Lilloa 12: 155, is actually the type collection of V. bangiana Moldenke. Ruiz Huidobro 4275 looks much like V. montevidensis Spreng.

Mason (1957) tells us that V. littoralis is similar to V. bonariensis, but has leaves that taper to the base and are subsessile or short-petiolate, but not subcordate nor clasping [characters that apply about equally well to V. brasiliensis Vell.], and that it is infrequent along sloughs and ditches in Amador County and on Bouldin Island, California.

Additional citations: MEXICO: Chiapas: Breedlove 12184 (Mi),

19855 (Mi); Moldenke & Moldenke 2262 (Rf). Michoacán: A. R. Moldenke 1682 (Ac). Oaxaca: Pringle 4877 (Ms—30792). San Luis Potosí: Moldenke & Moldenke 2151 (Rf). Veracruz: Moldenke & Moldenke 2230 (Ac). GUATEMALA: Alta Verapaz: Molina R. & Molina 11964 (N). VENEZUELA: Federal District: Alston 5430 (N). GALAPAGOS ISLANDS: Albemarle: J. T. Howell 8959 (Gg—462957). Charles: J. T. Howell 8882 (Gg—462955, Gg—462956); Wiggins & Porter 423 (Rf). Chatham: Schimpff 132 (N). PERU: Huánuco: Belshaw 3054 (Rf). BOLIVIA: Santa Cruz: Peredo s.n. [23-IV-1946] (Ms—34306). PARAGUAY: Morong 1204 (Ws). JUAN FERNANDEZ ISLANDS: Masafuera: Solbrig, Moore, & Walker 3664 (S). ARGENTINA: Corrientes: Ruiz Huidobro 4275 (Ws). POLYNESIA: HAWAIIAN ISLANDS: Oahu: A. A. Heller 2046 (Ms—30760).

VERBENA LITORALIS var. CARACASANA (H.B.K.) Briq.

Emended synonymy: Verbena caracasana H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223. 1817.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 223 (1817) and ed. quart., 2: 275--276. 1818; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Moldenke, Phytologia 11: 470. 1965.

It should be noted here that the H.B.K. reference dates given above have been authenticated by the work of Barnhart (1902).

VERBENA LOBATA Vell.

Additional bibliography: Moldenke, Phytologia 13: 252. 1966.

Additional citations: BRAZIL: Rio Grande do Sul: O. Camargo 2297 [Herb. Anchieta 61817] (B); Rambo 51505 (B), 56821 (B); Sehnem 5449 (B). Santa Catarina: Rambo 60070 (B).

VERBENA LOBATA var. HIRSUTA Moldenke

Additional bibliography: Moldenke, Phytologia 11: 470. 1965.

Additional citations: BRAZIL: Paraná: Hatschbach 14898 (Rf).

VERBENA LOBATA var. SESSILIS Moldenke

Additional bibliography: Moldenke, Phytologia 10: 83. 1964.

Additional citations: BRAZIL: Paraná: Hatschbach 14883 (Rf).

VERBENA MACDOUGALII Heller

Additional bibliography: Holmgren & Reveal, U. S. Forest Serv. Res. Paper INT.32: [Checklist Vasc. Fl. Intermont. Reg.] 91. 1966; Moldenke, Phytologia 14: 289. 1967.

Weber calls this a "common roadside plant", while Ferris refers to it as "weedy, on yellow pine - oak covered slopes".

Additional citations: COLORADO: Conejos Co.: W. A. Weber 7865a (Du—353355). NEW MEXICO: Lincoln Co.: Wootton 208 (Ms—30816). San Miguel Co.: R. J. Ferris 11521 (Du—322070). ARIZONA: Coconino Co.: MacDougal 249 (Ms—30795—isotype).

VERBENA MACROSPERMA Speg.

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Moldenke, *Phytologia* 14: 289. 1967.

VERBENA MARITIMA Small

Additional bibliography: Moldenke, *Phytologia* 14: 289. 1967.

Additional citations: FLORIDA: Brevard Co.: Curtiss 1963* (Ms-30754). Broward Co.: H. N. Moldenke 24051 (Ac, B, Ms, Rf, Ws).

VERBENA MARRUBIODES Cham.

Additional bibliography: Moldenke, *Phytologia* 14: 289. 1967.

The Rambo 57298, distributed as V. marrubioides, is actually V. humifusa Cham.

Additional citations: BRAZIL: Paraná: Hatschbach 12843 (Ac); L. S. Smith Bras.63 (Ac). Rio Grande do Sul: O. Camargo 1836 [Herb. Anchieta 62095] (B); Rambo 44156 (B).

VERBENA MEGAPOTAMICA Spreng.

Additional bibliography: Teague, Anal. Mus. Hist. Nat. Montev., ser. 2, 7 (4): 44. 1965; Moldenke, *Phytologia* 14: 289. 1967.

Teague (1965) refers to this species as a common ruderal plant, spreading among crops, but not too troublesome in Paraguay, and records the common names "margarita del campo" and "yvyty la novia", citing his nos. 52 & 310.

The Rambo, Herb. Anchieta 54947, distributed as V. megapotamica and so cited by Rambo (1965), is actually V. pulchra Moldenke, while his 59244 is V. phlogiflora Cham.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo, Herb. Anchieta 60153 (B).

VERBENA MENDOCINA R. A. Phil.

Additional & emended bibliography: Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 68. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 1179. 1895; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 1, 451 (1906) and pr. 2, 451. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 2: 1179. 1946; Durand & Jacks., Ind. Kew. Suppl. 1, pr. 3, 451. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 1179. 1960; Hocking, Excerpt. Bot. A.10: 270. 1966; Moldenke, *Phytologia* 14: 289. 1967.

VERBENA MENTHAEFOLIA Benth.

Additional bibliography: Benth., Bot. Voy. Sulphur 153. 1846; Munz, Calif. Spring Wildfls. 60, fig. 105. 1961; Moldenke, *Phytologia* 14: 289 (1967) and 15: 495. 1968.

Illustrations: Munz, Calif. Spring Wildfls. fig. 105. 1961.

Recent collectors have found this species growing on the upper margins of a beach with Eclipta alba, Panicum arizonicum, and Jouvea pilosa, and under shrubs on a tableland heavily covered with shrubs, as well as on grassy valley floors. Breedlove refers to it as a suffrutescent perennial. The Andrew Moldenkes describe it as

an "abundant weed in agriculturally disturbed areas" in Querétaro.

The corollas are described as "blue" on Breedlove 1498 & 14430. Part of the inflorescence is galled on A. R. Moldenke 1799.

Additional citations: MEXICO: Baja California: Wiggins & Wiggins 18075 (Du--507539). Chiapas: Breedlove 14430 (Ac). Coahuila: Edw. Palmer 1042 (Ms--30804). Jalisco: A. R. Moldenke 1652 (Rf), 1706 (Ac). Michoacán: A. R. Moldenke 1761 (Rf), 1763 (Rf), 1765a (Ac), 1785 (Ac), 1786 (Rf), 1799 (Ac). Querétaro: Moldenke & Moldenke 2158 (Rf). Sonora: Breedlove 1498 (Du--496235); A. R. Moldenke 1547 (Rf).

VERBENA MICROPHYLLA H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2:

220, pl. 133. 1817 [not V. microphylla R. A. Phil., 1857].

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 220, pl. 133 (1817), ed. quart., 2: pl. 133 (1817), and ed. quart., 2: 272--273. 1818; Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 68--69. 1881; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Meyer & Weyrauch, Guía Excurs. Biol. Tucum. 32 & 123. 1966; Moldenke, Phytologia 14: 289--290. 1967.

Additional & emended illustrations: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: pl. 133 [in color] (1817) and ed. quart., 2: pl. 133. 1817.

Hieronymus (1881) describes two unnamed forms of this species: (a) foliis parce strigoso-hispidulis, (b) foliis dense strigoso-hispidulis, canescentibus. The latter he regards as Philippi's V. sulfurea var. canescens and the former as Echegaray's V. sulfurea. It may well be that he confused this taxon with V. microphylla R. A. Phil., which is a synonym of Junellia minutifolia (R. A. Phil.) Moldenke, but the synonyms which he cites certainly belong to neither of these taxa. Verbena sulphurea D. Don is entirely different.

It should be noted here that the H.B.K. reference dates given above have been authenticated by consultation of Barnhart's (1902) research on the subject.

VERBENA MINUTIFLORA Briq.

Additional bibliography: Moldenke, Phytologia 14: 290. 1967.

Herbarium material of this plant has been misidentified and distributed under the name V. littoralis H.B.K. The Rambo 45339, cited below, was previously cited by me in error as V. montevidensis Spreng. On the other hand, the Rambo 51616 previously cited as V. minutiflora is actually V. montevidensis.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo, Herb. Anchieta 45339 (Du--374477), 54985 (B).

xVERBENA MOECHINA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 290. 1967;

Moldenke, *Résumé Suppl.* 15: 2. 1967.

Additional citations: ILLINOIS: Saint Clair Co.: Eggert s.n. [Bluffs in Illinois, 12 August 1875] (Ms—30841, Ms—30842). ARKANSAS: Washington Co.: J. T. Buchholz s.n. [June 27, 1923] (Ac, Ws).

VERBENA MONTEVIDENSIS Spreng.

Additional bibliography: Moldenke, *Résumé Suppl.* 15: 2. 1967; Moldenke, *Phytologia* 14: 290 (1967) and 16: 52 & 55. 1968.

Ewan describes this plant as "glabrous throughout", with pale-violet flowers, growing on river overflow lands, flowering and fruiting in June, in Louisiana. The corolla is described as "blue" on Montes 15556.

Recent collectors have found V. montevidensis growing in shrubby marshes, and material has been misidentified and distributed as V. gracilescens (Cham.) Herter. The Rambo 45339, cited by me as this species in a previous publication, seems to be V. minutiflora Briq. instead. On the other hand, the Rambo, Herb. Anchieta 51616, cited below, was previously incorrectly cited by me as V. minutiflora. The Rambo, Herb. Anchieta 54985, cited by Rambo (1965) and so distributed by him, is actually V. minutiflora, while 60193 is V. reitzii Moldenke.

Additional citations: LOUISIANA: Avoyelles Par.: Ewan 19083 (Rf). Franklin Par.: Ewan 19152 (Ac). BRAZIL: Paraná: Saito 288 (Rf). Rio Grande do Sul: O. Camargo 621 [Herb. Anchieta 60406] (B), 959 [Herb. Anchieta 59429] (B), 2480 [Herb. Anchieta 62791] (B); Machado s.n. [Herb. Anchieta 60703] (B); Pivetta 966 [Herb. Anchieta 59154] (B); Rambo, Herb. Anchieta 49723 (Du—376609), 51616 (W—2102102). URUGUAY: Herter 269 [Herb. Herter 81713] (Ws). ARGENTINA: Buenos Aires: Krapovickas 2678 (Ms—34303). Misiónes: Montes 15556 (Du—411354).

VERBENA MULTIGLANDULOSA Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 253. 1966; Moldenke, *Biol. Abstr.* 47: 6794. 1966; Hocking, *Excerpt. Bot. A.* 11: 103. 1967.

VERBENA NEOMEXICANA (A. Gray) Small

Additional & emended bibliography: A. Gray, *Syn. Fl. N. Am.*, ed. 1, 2 (1): 337 (1878) and ed. 2, 2 (1): 337. 1886; Moldenke, *Phytologia* 14: 290 (1967) and 15: 494. 1968.

Chambers encountered this plant growing on rocky volcanic slopes in Baja California. Material has been misidentified and distributed in herbaria under the names V. littoralis H.B.K. and V. robusta Greene. On the other hand, the Nelson & Nelson 5129 and J. H. Thomas 8185, distributed as typical V. neomexicana, are actually var. hirtella Perry, while Nelson & Nelson 5138 is var. xylopoda Perry.

It should be pointed out that both Gray and Small wrote this spe-

cific epithet as "neo-mexicana", and so this is the orthography which should perhaps be adopted.

Additional citations: TEXAS: Jeff Davis Co.: Tharp & Janszen 49-1144 (Ms--34311). NEW MEXICO: Socorro Co.: O. B. Metcalfe 612 (Ms--30796). MEXICO: Baja California: K. L. Chambers 728 (Du--406350); C. R. Orcutt s.n. [Mts., Northern Lower California, 7-8-1885] (Ms--30793, Ms--30794).

VERBENA NEOMEXICANA var. HIRTELLA Perry

Additional bibliography: Moldenke, *Phytologia* 14: 290 (1967) and 15: 494. 1968.

Thomas found this plant growing in a rocky channel leading into a dry lake in Baja California. The corollas are said to have been "lavender" on J. H. Thomas 8185.

The Tharp & Janszen 49-1144, distributed as this variety, is actually typical V. neomexicana (A. Gray) Small, while the M. E. Jones 28296, cited by me in a previous installment of these notes, proves on closer examination to be atypical V. canescens var. roemeriana (Scheele) Perry.

Additional citations: TEXAS: Brewster Co.: Nelson & Nelson 5129 (Du--331386). MEXICO: Baja California: J. H. Thomas 8185 (Du--419817).

VERBENA NEOMEXICANA var. XYLOPODA Perry

Additional bibliography: Moldenke, *Phytologia* 14: 290. 1967.

The corollas on Moldenke & Moldenke 2105 are described by the collectors as "uniform blue".

Additional citations: TEXAS: Webb Co.: Nelson & Nelson 5138 (Du--331412). ARIZONA: Santa Cruz Co.: Pringle s.n. [Santa Rita Mts., May 11, 1884] (Ms--30833). MEXICO: Chihuahua: Moldenke & Moldenke 2105 (Rf); Pringle 270 (Ms--30781). San Luis Potosí: Breedlove 15479 (Ac).

VERBENA OFFICINALIS L.

Additional & emended bibliography: H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: 222 (1817) and ed. quart., 2: 274. 1818; Hook. f., *Trans. Linn. Soc. Lond. Bot.* 20: 194. 1847; N. J. Anderss., *Vet. Akad. Handl. Stockh.* 1853: 199. 1854; Schnitzl., *Icon. Fam. Nat. Reg. Veg.* 137. 1856; N. J. Anderss., *Galap. Veg.* 81. 1859; Prior, Pop. Names Brit. Pl. 206. 1863; A. Gray, *Syn. Fl. N. Am.*, ed. 1, 2 (1): 335. 1873; Boiss., *Fl. Orient.* 4: 534. 1879; Stapf, Denkschr. Math.-nat. Class. K. Akad. Wiss. Wien 50 [Bot. Ergebn. Polak. Exped. 1]: 35. 1885; A. Gray, *Syn. Fl. N. Am.*, ed. 2, 2 (1): 335. 1886; H. Fischer, *Beitr. Vergl. Morphol. Pollenk.* 46. 1890; Bagnall, Fl. Warwicksh. 200--201 & 518. 1891; B. L. Robinson, *Proc. Am. Acad.* 38: 197. 1902; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Prain, Beng. Pl., ed. 1, 2: 826. 1903; Borrm., *Beih. Bot. Centralbl.* 22 (2): 117. 1907; Bourdier, Journ. Pharm. Chim. 1908: [6], 27, 49, 101, & *Chem. Centralbl.* 1: 955. 1908; Duthie, Fl. Up-

per Gang. Plain 2: 218. 1911; Holste, Merck's Jahresber. 31-32: 513. 1917-1918; Holste, Zeitschr. Exp. Path. Ther. 19: 483. 1918; Haines, Bot. Bihar & Orissa 4: 707 & 708. 1922; Molliard, Feuille Nat. 45: 41--44. 1924; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 628 (1924) and pr. 2, 628. 1925; Marzell, Naturforsch. 3: 417--421. 1926; Savelli, Nuov. Giorn. Bot. Ital., new ser., 34: 396-402, fig. 1--7. 1927; Grieve & Leyel, Modern Herb., pr. 1, 2: 831--832. 1931; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 1, 153, 241, & 260. 1932; P'ei, Sinensia 2: [65]. 1932; Tu, Chinese Bot. Dict., abrdg. ed., 851. 1933; Reichert & Hoffmann, Arch. Pharm. & Ber. Deut. Pharm. Ges. 273: 351--360. 1935; Souèges, Compt. Rend. Acad. Sci. Paris 201: 234--236 & 529--531. 1935; Rendle, Notes Fl. Bermuda 16. 1937; Cheymol, Journ. Pharm. & Chim., ser. 8, 25: 110--117 & 1020. 1937; Cheymol, Bull. Soc. Chim. Biol. 19: 1609--1625 & 1647. 1937; Reichert & Hoffmann, Arch. Pharm. & Ber. Deut. Pharm. Ges. 275: 474--477. 1937; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 628. 1938; Kuwazima, Chem. Abstr. 1939: 7396. 1939; V. Quinn, Stories & Legends Gard. Fls. 215--218. 1939; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 4, 628. 1944; Karrer & Solomon, Helv. Chim. Acta 29: 1544. 1946; Karrer & Solomon, Chem. Abstr. 1947: 1643. 1947; L. H. Bailey, Man. Cult. Pl., ed. 2, 840. 1949; McClintock & Fitter, Pocket Guide Wild Fls. 150, fig. 742. 1955; Karrer, Konstit. & Vork. Organ. Pflanzenst. 279 & 453. 1958; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14348, 14349, & 14361. 1958; R. M. Carleton, Ind. Common Names Herb. Pl. 31, 42, 61, 62, 69, 81, 92, 96, 105, 107, 116, 120, & 125. 1959; Grieve & Leyel, Modern Herb., pr. 2, 2: 831--832. 1959; Ary, Gregory, & Nicholson, Oxford Book Wild Fls. 136 & 137. 1960; Maatsch in Encke, Pareys Blumergärtn., ed. 2, 2: 439. 1960; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1054 & 1453. 1962; Maheshwari, Fl. Delhi 278. 1963; Prain, Bengal Fl., ed. 2, 2: 617. 1963; Banerji, Rec. Bot. Surv. India 19: 75. 1965; Pitschman, Reisigl, & Schiechl, Fl. Südalp. 189. 1965; S. A. Manning, Syst. Guide Flow. Pl. 18, 141, & 142. 1965; W. K. Martin, Concise Brit. Fl. pl. 67. 1965; Datta, Handb. System. Bot. 182. 1965; Chopra, Badhwar, & Ghosh, Poison. Pl. India 2: 695 & 700--701, fig. 179. 1965; Readett, Hawkes, & Cadbury, Proc. Birmingham. Nat. Hist. Soc. 20 (4): 43. 1965; Ohwi, Fl. Jap. 763. 1965; G. B. Foster, Herbs for Every Gard. 199. 1966; Polunin & Huxley, Fls. Medit. 154. 1966; Szafer, Veg. Poland 298. 1966; Hartley, Univ. Iowa Stud. Nat. Hist. 21: 162. 1966; Helmcke, Fl. Magica 39. 1966; Hocking, Excerpt. Bot. A.10: 270. 1966; Prodan & Buia, Fl. Mic. Ilus. Roman. 401. 1966; C. Weber, Boissiera 12: 167. 1966; Kaul & Zutshi, Journ. Indian Bot. Soc. 45: 358 & 360. 1966; Berrall, Gard. Illustr. Hist. 44, 279, & 326. 1966; Braun-Blanquet, Acta Geobot. 14 (3): 10, 11, & 112. 1967; Rickett, Wild Fls. U. S. 2 (2): 464 & 686. 1967; Moldenke, Résumé Suppl. 15: 1, 5, 8, & 15. 1967; Dony, Fl. Hertfordsh. 89, map 37a. 1967; Zukowski, Fl. Polska 11: [63]--65. 1967; Anon., Biol. Abstr. 48 (17): S.182. 1967; Moldenke, Phytologia 14: 290--292 (1967) and 15: 484. 1968.

Additional illustrations: Marzell, Naturforsch. 3: 417--421.

1926; Savelli, Nuov. Giorn. Bot. Ital., new ser., 34: 399, fig. 1--7. 1927; Souèges, Compt. Rend. Acad. Sci. Paris 201: 234--236 & 529--531. 1935; McClintock & Fitter, Pocket Guide Wild Fls. fig. 742 [in color]. 1955; Ary, Gregory, & Nicholson, Oxford Book Wild Fls. 137 [in color]. 1960; Chopra, Badhwar, & Ghosh, Poison. Pl. India 2: 701, fig. 179. 1965; W. K. Martin, Concise Brit. Fl. pl. 67 [in color]. 1965; S. A. Manning, Syst. Guide Flow. Pl. 141. 1965.

Foster (1966) reminds us that this plant was considered a good tonic in the olden days, while Berrall (1966) tells us that Pliny, the Elder, mentioned verbenas, that Victorian gardeners used it, and that 19th Century China Clipper ships brought back verbenas. Polunin & Huxley (1966) inform us that it was one of the few herbs considered by Hippocrates to be all-curing. These same authors describe the species as circum-Mediterranean, inhabiting tracksides, waste places, and screes.

Grieve (1931) tells us that Verbena officinalis was first discovered, according to legend, on the Mount of Calvary where it staunched the wounds of the crucified Jesus. Hence it is crossed and blessed with a commemorative verse when it is gathered. It actually contains a peculiar tannin with many medical uses.

Szafer (1966) says that the species is found in Poland in the "ruderal association of Order Onopordetalia Class Ruderalo-Secalinetea". Ary, Gregort, & Nicholson (1960) report it as found in waste places in England and Wales, flowering there from July to September, and once used in love potions. It has been found growing in chalky waste ground in England and in clearings in Thailand.

Quinn (1939) tells us that Verbena was sacred to the Romans and Greeks, the origin of the worship being lost in antiquity unless literally interpreted as originating from the tears of an angry Juno, possibly in reference to Callisto at the time when the gnashing of her teeth was not sufficient indication of her rage and tears of anger flowed. It seems that Callisto was very beautiful and was befriended by Juno and allowed to stay around the house for much of the time. As was probably inevitable, Jove started to pay too much attention to her and this enraged Juno so much that she turned Callisto into a bear with the admonition "Now get down on all fours and see if my husband will notice you". While eating berries in the forest a young hunter approached with his spear and was recognized by Callisto, now a bear, as her son. Jove snatched both the bear and the hunter into the sky and they now form the constellations of the Great Bear and the Little Bear.

Juno was enraged to see that Callisto was thus placed in the heavens. She sought the aid of Oceanus. Her tears from much weeping soaked into the ground and vervain sprang up. At her request, Oceanus promised Juno that, as punishment, Callisto would never be able to rest in the water, nor would her son; therefore the Great Bear and the Little Bear constellations even today never sink into the sea as do the other stars, the sun, and the moon!

This legend appears to be the origin of the name "Juno's tears" for the plant.

Dioscorides reports that the leaves of vervain were used to cleanse tables preparatory to festivities to honor Zeus. Its leaves were worn as amulets. Pliny tells us that altars were strewn with vervain during various pagan rites. The Druids of Britain and Gaul regarded vervain as reverentially as they did their sacred oaks partly because they saw a similarity in leaf form. Before gathering vervain, honey and honeycombs were poured on the earth as a recompense for depriving it of so precious a gift.

Vervain was used in religious ceremonies and in medicine, and was never gathered when the sun or moon were visible, nor ever touched by human hands. Iron instruments were used for digging the plants and strings were used for plucking them. The oldest Druids then wrapped the plants and carried them to the place of worship.

Interest in vervain died down with the passing of druidism, but was revived when the Crusaders returned from the Holy Land with great new tales about it. One such tale stated that the vervain grew first on Mount Calvary, having sprung up as the nails were driven into Jesus' hands. The Crusaders also told of witnessing miraculous cures effected by vervain. Because of these tales, vervain soon replaced rue and yarrow. It was thought that a man could obtain magic powers by bathing in undiluted vervain juice. Among these powers was supposed to be the ability to see into the future. He would also be given instant fulfillment of all his wishes, would be protected from disease, and would have the power of enchantment.

St. Neot, the Pygmy, a holy hermit monk in Cornwall 200 years before the Crusades, is said to have cleared some land to sow grain. Townspeople gave him a pair of oxen which were so impressed by his holiness that they slipped into their yokes and plowed his land voluntarily. A thief then stole these wonderful oxen. Two stags then appeared to take on the yokes and do the plowing. This greatly impressed the thief, who then returned the stolen oxen. Where the oxen had plowed previously oats sprang up, but where the stags had plowed vervain appeared. St. Neot, believing that the vervain must have been sent from heaven for some good purpose, brewed the leaves and made from them a febrifuge and healing poultice. The people of Cornwall even today ascribe these virtues to the vervain.

The corollas are described as "lilac" on Raven & Cannon 16432. The species is recorded from James Island in the Galapagos by Hooker (1847), Andersson (1854, 1859), and Robinson (1902) on the basis of a C. Darwin collection not as yet seen by me for verification. Hartley (1966) records it from "just outside the 'Driftless Area' in Sauk Co.", Wisconsin. Kaul & Zutshi (1966) report it as very rare in open grassland in Srinagar, India.

Zukowski (1967) records the Polish name "werbena lekarska". Additional common names are "holy-plant", "Mercury's blood", "pigeon-grass", "purvain", "setywall", "verbain", & "wild-hyssop".

ANACARDIACEAE: Rhoideae: Astronium

Fred A. Barkley *

The genus Astronium had its historical origin with the publication of Astronium graveolens in 1760 by Jacquin, who in 1763 published a drawing of the fruit, and in 1780 a drawing of the fruit and a leaf. The original specimens were cited as having come from Jamaica** and Colombia. In 1827 Schott published two additional species, Astronium fraxinifolium very similar to the original species, and Astronium concinnum, an extremely distinctive species.

In 1862 Manoel Freire Allemão (in Francisco Freire Allemão & Manoel Freire Allemão) published the genus Myracrodruon based on the species M. urundeuva, this genus being separated by having spherical ovaries in fruit as contrasted to the fusiform ovaries in the fruits of Astronium. Grisebach in 1864 published the species Astronium obliquum from Trinidad.

Engler originally, in the work of Martius and Eichler of 1876, kept Myracrodruon separate from Astronium, transferring A. concinnum and describing M. macrocalyx, both having the ovary in fruit obconical in form (and by the present writer considered synonymous). However,

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Two grants from the American Philosophical Society made the study possible. The writer is also grateful to the many curators from which specimens were borrowed for this study; and especially so to the directors and curators del Herbario del Instituto de la Botanica de la Fundación Miguel Lillo de la Universidad de Tucuman (Argentina) where the study was started, the Herbarium of the Chicago Natural History Museum, the Herbarium of the New York Botanical Garden and the Herbaria of Harvard University, where the study has been continued.

The original illustrations prepared by the artists of the Fundación Miguel Lillo and the accompanying manuscript, which had been submitted for publication to the Proceedings of the Iraqi Scientific Societies, permanently disappeared during the 14th of Ramadan Revolution, thereby much delaying the publication of this study.

** The present writer has seen no material of the genus from the West Indies, except from Trinidad.

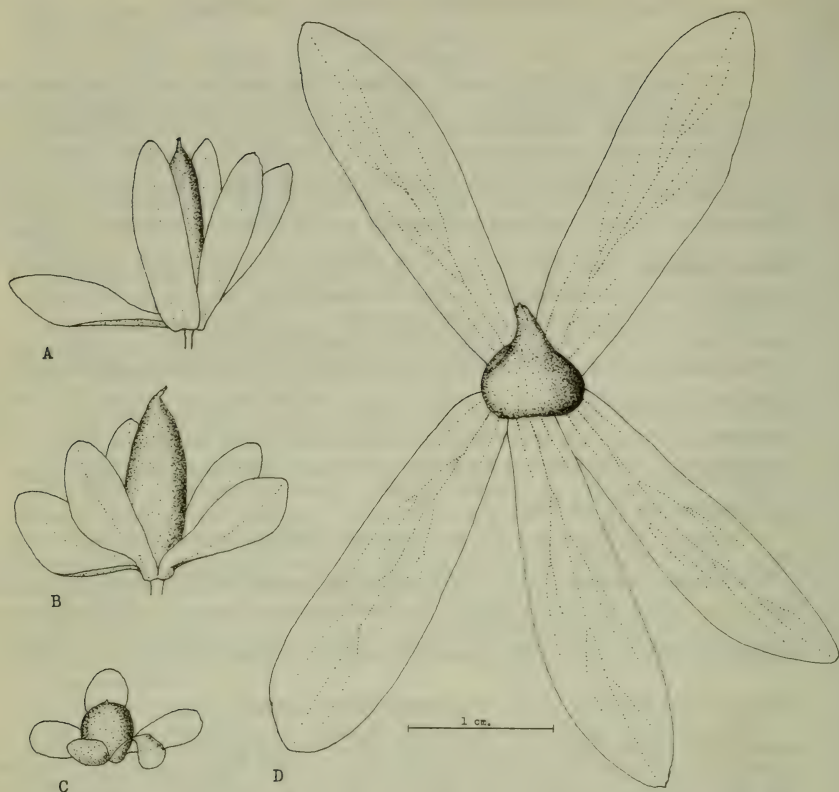


PLATE I. Fruit of Astronium. A. Astronium fraxinifolium Schott from Gardner 1535 of 1839. B. Astronium gracile var. acuminatum (Chodat & Hassler) Barkley from Hassler 6224. C. Astronium urundeuva (Fr. Allamão) Engler from Venturi 5043. D. Astronium concinnum Schott from Glaziou 15903.

in 1881 he described another species, Astronium balansae, having the ovary spherical in fruit, and submerged Myracrodruon in Astronium as a section.

This treatment of Engler was followed without change except for the publication of Astronium conzatii Blake in 1918 and A. lecointei Ducke in 1922, until the publication of a monograph by Mattick in 1934 in which three additional species were described, A. ulei, A. gardneri, and A. glaziovii, and several forms were named.

In common with many genera of the tribe Rhoideae the members of this genus have cyclic, heterochlamydic and 5-parted flowers, with a superior, tricarpellary compound pistil but with a single fertile carpel which contains a single apically attached ovule. The stamens are 5 and alternate with the petals. There is a disk between the stamens and pistil (fig. 1).

In the staminate flowers the sepals are usually orbicular, but in the pistillate flowers are obovate and grow very rapidly after pollination, usually the growth in their length about equalling the growth of the ovary in those having obconical or spherical ovaries in fruit. The five enlarged persistent sepals are characteristic of the fruits. The petals do not increase in size in fruit, but are persistent.

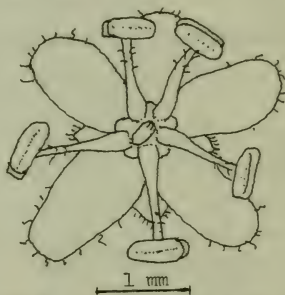


Figure 1. Staminate flower of Astronium urundeuva (Fr. All.) Engler, from Hassler 11890.

The fruit of all species has a thin exocarp and resinous mesocarp. The fruit in A. concinnum has comparatively enormous sepals, the ovary is obconical and slightly five-lobed at the base, and has a very thin endocarp on the somewhat flattened seed; A. balansae and A. urundeuva have spherical ovaries, thick, bony, and very rough

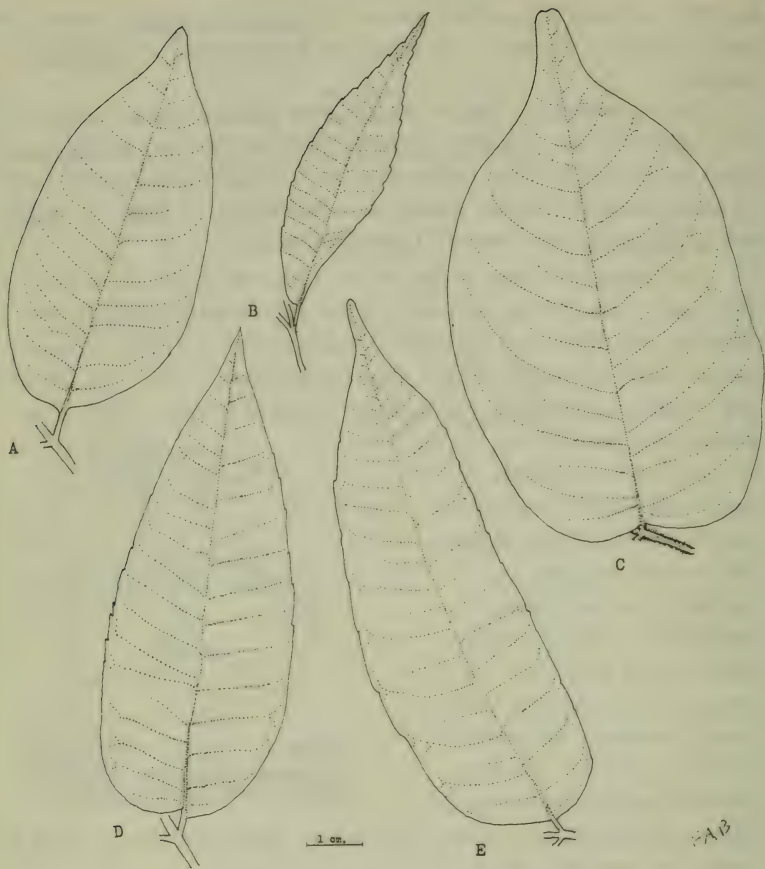


PLATE II. Leaflets of Astronium. A. Astronium concinnum Schott from Glaziou 15903. B. Astronium balansae Engler from Lillo 10587. C. Astronium fraxinifolium Schott from Pittier 8679. D. Astronium urundeuva (Fr. Allamão) Engler from Hassler 11890. E. Astronium graveolens Jacquin from Curran 354.

endocarp, and more or less spherical seeds; the other species all have long fusiform fruits, thin and more or less smooth endocarp, and long fusiform seed.

The species are apparently forest trees of considerable size, but information in regard to size and shape of tree and type of root system is remarkably scanty.

Schizo-lysigenous canals are present in the phloem and extend to the leaves and flowers. The contents of these canals apparently is non-toxic.

The leaves are always alternate and imparipinnately (or very rarely an occasional leaf paripinnately) compound, and usually short petiolulate. The laminae are usually thin. The upper surface may be lustrous or dull. The laminae entire or finely serrate and are rarely slightly revolute. The rachis is wingless.

With a few exceptions the pubescence is quite characteristic in abundance and size for each species or variety. The pubescence when present is characteristically of unbranched trichomes.

The inflorescence is a terminal thyrsus with or without accompanying panicles produced in the uppermost nodes. The inflorescences are produced in distinctive buds covered with scales. Each branch of the inflorescence is subtended by a bract which in form is similar to the scales of the bud, each secondary branch by an oblanceolate bract, and the pedicels by deltoid-lanceolate bracts. These buds are almost as characteristic of the genus as are the enlarging sepals of the pistillate flowers.

The plants being polygamodioecious, either have only pistillate or only staminate flowers. The staminate flowers have small orbicular sepals, well developed stamens, and the ovary is extremely rudimentary; the pistillate flowers have obovate large sepals, which grow very rapidly after pollination, becoming the 'wings' of the fruit, small sterile stamens, and the well developed ovary that enlarges very rapidly after pollination.

The five petals are persistent, but not enlarged, in fruit.

The disk is usually five-lobed and is not particularly prominent.

The stamens are borne under the edge of the disk, the anther is oblong-ovate, the filaments are slender but somewhat thickened below. The stamens in the pistillate flowers are rudimentary.

The three stigmas and styles are separate, the styles being very short, the stigma of the fertile carpel being only slightly larger than the other two. They are persistent in fruit.

Specific delimitation is not particularly difficult between most of the species. Astronium graveolens with its varieties, Astronium fraxinifolium with its variety, and Astronium gracile, while typically are very different in appearance from each other have many individuals which are intermediate and therefore are difficult to delimit.

Taxonomically the difficulties involved in the present study are mostly from the fault of sufficient specimens or of sufficient data accompanying the specimens, from the fact that several species flower or fruit, or even flower and fruit, at times when there are no leaves present. Since it is a very widespread genus, it is probable that the paucity of specimens is due to its being a difficult tree to ascend and because of the lack of leaves at flowering time.

The genus ranges from southern Mexico and Jamaica to Trinidad and Colombia, southward east of the Andes to Bolivia, Argentina, and Paraguay.

ASTRONIUM Jacquin

Jacquin, Enum. Plant. Carib. 10. 1760; Jacquin, Select. Stirn. Americ. Hist. Linn. Syst. Deter. 261. 1763; Jacquin, Select. Stirp. Americ. Hist. 126. 1780; Kunth, Ann. Sc. Nat. 1, 2: 341. 1824; De Candolle, Prodr. Syst. Nat. Regn. Ver. 2: 65. 1825; Bentham & Hooker, Gen. Plant. 1: 423. 1862; Marchand, Rev. Anac. 177. 1869; Marchand, Terebinthacées et de Ceux de Leurs Prod. Qui sont Util. en Pharm. 179. 1869; Engler in Martius & Eichler, Fl. Brasil 12²: 393. 1876; Engler, Bot. Jahrb. 1: 382,

391. 1881; Engler in De Candolle, Monogr. Phaner. 4: 453. 1883; Engler in Engler & Prantl, Nat. Pflanzenf. 3⁵: 172. 1892; Mattick, Notizbl. Bot. Gart. Berlin 11: 995. 1934; Cabrera, Rev. Museu la Plata n.s. 2: 43. 1938.

Myracrodruon Man. Fr. Allemão, in Fran. Fr. Allemão & Man. Fr. Allemão, Trabal. da Comm. Scient. de Explor.: Secção Botanica 1: 3. 1862; Bentham & Hooker, Gen. Plant. 1: 1000. 1867; Engler in Martius & Eichler, Fl. Brasil 12²: 400. 1876.

Deciduous trees with hard wood. Leaves alternate, imparipinnate; lateral leaflets more or less unequal, more or less opposite, shortly petiolulate, the terminal leaflet petiolulate, leaflets entire or finely serrate, glabrous to pilose, acute to acuminate at apex, at base obtuse. Flowers polygamodioecious, small in ample panicles at the uppermost axils and in terminal thyrsi, the inflorescences shorter than the leaves, produced in perulate buds. Calyx of 5 sepals, these accrescent in the pistillate flowers. Petals 5, oblong or oval, smaller in the pistillate flowers, persistent in fruit, in the staminate flowers about twice as long as the sepals. Stamens 5, alternate with the petals and lobes of the disk, the filaments slender but somewhat enlarged below, the anthers oblong-ovate, in the staminate flowers the stamens usually slightly exceeding the petals, in the pistillate flowers sterile and much smaller. Disk annular, 5-lobed. Ovary 3-carpelled (rarely abnormal and 2-carpelled). Stigmas and styles minute, persistent. Ovary in fruit oblong-fusiform or obovoid-fusiform, obconical or spherical, the epicarp thin, the mesocarp resinous, and the endocarp either membranaceous-chartaceous or bony. Ovules suspended from the apex of the cavity of the carpel. The seed exalbuminous, the cotyledons plano-convex, elongate, the radical short and straight. Forest trees of the American tropics.

KEY TO THE TAXA

- 1 Involucrate with calyx lobes (in fruit) slightly longer than the fusiform, apiculate fruit. I. Subgenus EUASTRONIUM
 - 2 Leaflets 3 to 7 (mostly 5), all oval, very slightly oblique, glabrous, shining above, subacute.
 1. Astronium ulei
 - 2 Leaflets 5 to 25, lanceolate to rotund, usually noticeably oblique, usually acute to acuminate.
 - 3 Leaflets 17 to 25, 1.5 to 2 cm. long.
 3. Astronium glaziouvii
 - 3 Leaflets 5 to 15, 3 to 16 cm. long.
 - 4 Leaflets (usually narrowly) ovate-lanceolate or oblong-lanceolate.
 - 5 Leaflets entire or essentially so.
 - 6 Leaflets narrowly lanceolate.
 5. Astronium gracile
 - 6 Leaflets broadly lanceolate.
 - 7 Leaflets ovate-lanceolate.
 4. Astronium obliquum
 - 7 Leaflets oblong-lanceolate.
 2. Astronium lecointei
 - 5 Leaflets subentire; serrate or sometimes only indistinctly crenulate.
 - 6 Leaflets narrowly lanceolate or oblong-lanceolate.
 - 7 Leaflets shortly acuminate.
 - 8 Leaflets finely serrate, glabrate or subglabrate, at least at maturity.
 5. Astronium gracile
 - 8 Leaflets subserrate.
 - 9 Leaflets glabrous or subglabrous at maturity.
 - 5a. Astronium gracile var. acuminata
 - 9 Leaflets velvety pilose at maturity at least below.
 - 8a. Astronium konzattii var. lundellii
 - 7 Leaflets long acuminate, distinctly serrate.
 - 8 Leaflets glabrous or essentially so.

- 9 Leaflets thickish, broadly lanceolate, obscurely serrate.
 - 5a. Astronium gracile var. acuminata
- 9 Leaflets thin, narrowly lanceolate, finely but sharply serrate.
 - 8b. Astronium konzattii var. standleyi
- 8 Leaflets sparsely pilose.
 - 8. Astronium konzattii
- 6 Leaflets broadly lanceolate or ovate-lanceolate.
- 7 Leaflets pilose at least below.
 - 8 Leaflets pilose.
 - 7a. Astronium graveolens var. inodorum
- 8 Leaflets densely velvety-pilose above and below.
 - 9. Astronium mirandai
- 7 Leaflets glabrous below.
 - 8 Leaflets broadly ovate-lanceolate, abruptly acuminate.
 - 7b. Astronium graveolens var. dugandii
- 8 Leaflets oblong-lanceolate, abruptly acutish.
 - 7. Astronium graveolens
- 4 Leaflets ovate, oblong-ovate, or rotund.
- 5 Leaflets subentire to distinctly serrate.
- 6 Leaflets cuneate to broadly cuneate at the base.
 - 7 Leaflets densely velvety-pilose above and below, narrowly ovate.
 - 9. Astronium mirandai
- 7 Leaflets, if pilose, not densely so.
 - 8 Leaflets, if pilose, not densely so.
 - 7a. Astronium graveolens var. inodorum
- 8 Leaflets glabrous.
 - 7b. Astronium graveolens var. dugandii
- 6 Leaflets obtuse to cordate-obtuse at the base.
 - 7 Leaflets and stems pilose.
 - 6. Astronium fraxinifolium
- 7 Leaflets and stems not pilose.
 - 6a. Astronium fraxinifolium var. glabrum
- 5 Leaflets entire.

- 6 Leaflets small, velvety-pilose, dull above.
 - 10. Astronium gardneri
- 6 Leaflets large, not velvety-pilose above.
 - 7 Leaflets pilose on the veins.
 - 2a. Astronium lecontei var. tomentosum
 - 7 Leaflets glabrous.
 - 2. Astronium lecontei
- 1 Involucrate with calyx much longer than the ovoid-globose fruit.
 - II. Subgenus MYRACRODRUON
 - 2 Fruit globose-ovoid, endocarp bony; lobes of the calyx in fruit less than 1 cm. long. IIa. Section Eumacrodruon
 - 3 Leaflets lanceolate, long petiolulate, serrate or subserrate.
 - 12. Astronium balansae
 - 3 Leaflets ovate or oblong-ovate, short petiolulate, entire or essentially so.
 - 4 Leaves more or less sparsely pilose.
 - 11. Astronium urundeuva
 - 4 Leaves glabrous. 11a. Astronium urundeuva var. candollei
 - 2 Fruits globose-obconical, endocarp chartaceous; leaflets 3 to 9; calyx segments in fruit 2 cm. long or longer.
 - IIb. Section Macrocalyx
 - 13. Astronium concinnum

I. Subgenus EUASTRONIUM (Engler) Barkley, n. stat.

Astronium Jacq., Enum. Plant. Carib. 10. 1760; Engler in Martius & Eichler, Flora Brasil 12²: 397. 1876.

Section Euastronium Engler in DC., Monog. Phaner. 4: 453. 1883.

Fruit oblong-fusiform, apiculate, the mesocarp is resinous but very thin, the calyx lobes are about the length of the ovary, the endocarp is thin and chartaceous, and the fruit is fusiform and terete.

This section, with species ranging from Southern Mexico to Northern Argentina, is composed of a series of several very similar species each of which show considerable variation. Unfortunately there are insufficient complete specimens available for all of these species to give the excellent understanding of the species that one would like, and as contrasted to the subgenus MYRACRODRUON.

1. Astronium ulei Mattick, Berlin Bot. Gart. Notizblatt 11: 996. 1934.

Tree to 40 m. high; branches glabrous, grayish-brown; leaves imparipinnately compound with 3 to 7 leaflets, 10-20 cm. long; leaflets thinly coriaceous, shining above, dull beneath, glabrous, ovate or rarely rotund, rounded-obtuse to subacute at apex, rounded-obtuse and frequently noticeably unequal at base, the margin subrevolute and entire, 4 to 9 cm. long, 2 to 6.5 cm. broad, the lateral petiolulate with glabrous petiolules about 5 mm. long, the terminal with petiolules 1 cm. long; rachis segments 2-3 cm. long, glabrous; petiole about 4 cm. long, glabrous; panicles axillary to the uppermost leaves, 6 to 25 cm. long, glabrous; pedicels slender, 2-3 mm. long in flower, in fruit 6 to 10 mm., glabrous; bracts triangular-ovate, .4-.6 mm. long, glabrous except ciliate on the margin; sepals semicircular in outline, .8 mm. wide, .5 mm. long, glabrous except ciliate on the margins; petals glabrous, ovate, narrowly obtuse, 1 mm. wide, 2 mm. long; stamens (in the staminate flowers) with anthers oblong, 1 mm. long, .2 mm. wide, filaments slender, 1.2 mm. long (in the pistillate flowers the stamens much smaller); disk extremely thin, .5 mm. in diameter, 5-lobed; pistil (in the staminate flowers) rudimentary, or in the pistillate with 3 capitate stigmas, 3 short styles and an elongate ovary; the fruit oblong-cylindric, acute at apex and base, the fruit walls adhering, 10-11 mm. long, 3 mm. in diameter, the petals persistent in fruit but not enlarged, the sepals enlarging, cuneate at base, narrowly obtuse to subacute at apex, 3-4 mm. broad, .9-1.1 cm. long.

Type: Brasil: Rio Branco: Feb. 1909, E. Ule 7959 in the herbarium of the Berlin Botanical Garden.

Distribution: Known only from northern Amazonas and adjacent British Guiana and Venezuela.

Common name: "Bauwana".

Specimens examined: VENEZUELA: between El Puente and La Vela de Coro, 2 April 1917, Curran & Haman 457 (VEN) and La Vela de Coro, 4 April 1917, 496 (GH); BRITISH GUIANA: western extremity of the Kanuku

Mountains in the drainage of the Takutu River, 300 m. alt., "tree to 15 m. high, with very few leaves", 4-22 March 1938, Smith 3126 (F, G, NY, S, US) and northwestern slopes of the Kanuku Mountains in the drainage of Moku-moku Creek, between 150-400 m. alt., "tree to 40 m. high, petals pale green", 31 March-16 April 1938, 3466 (F, G, LIL, NY, S, US); BRAZIL: RIO BRANCO: Rio Surumu: Serra de Pracana (Pacaraina), Feb. 1909, Ule 7960 (G, MG, NY, US) and March 1909, 1958 (G, MG, NY).

2. Astronium leccointei Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 202. 1922; Mattick, Berlin Bot. Gard. Notizblatt 11: 1006. 1934.

Large tree; branches maroonish gray, thickish, glabrous; the leaves 15-35 cm. long, pari- or imparipinnately compound, with about 8 or 9 leaflets; leaflets shining above, completely glabrous, 7 to 15 cm. long, 2-4.5 cm. broad, abruptly long acuminate at apex, more or less unequal and obtuse at base, petiolulate on petiolules 8-12 mm. long; internodes 3.5 to 5 cm. long; petiole 6 to 8 cm. long; inflorescences panicles 8 to 30 cm. long, glabrous, produced in cataphyll covered buds in the axils of the uppermost leaves; staminate flowers pedicellate on glabrous pedicels about 1 mm. long, sepals orbicular, obtuse, .5 mm. broad, .5 mm. long, petals oblong, obtuse, 1.2 mm. broad, 2 mm. long, stamens with filaments slender, anthers oblong-ovate, 1.2 mm. long, .5 mm. broad, the disk thin; the pistil rudimentary; pistillate flowers similar except sepals oblong-orbicular, 1.2 mm. broad, 1.5 mm. long, the petals slightly smaller and narrowed above, the stamens are rudimentary, and the pistil is about 2 mm. long, with three hemispherical stigmas, and three styles; fruit with calyx lobes about 1.4 cm. long, 3.5 to 4 mm. broad, rounded obtuse to subacute at apex, petals persistent, 2 mm. long, the ovary cylindric, narrowed at apex and base, about 4 mm. in diameter and as long as the sepals.

Type: Brazil: Para: in regione fluminis Trombetas ad orientem lacus Salgado, A. Ducke (13188) in the herbarium of the Jardim Botânico do Rio de Janeiro no. 8. Dr. Ducke points out that it is a tall forest tree and without leaves at the time of flowering. His original description of the species is: "Speciei A. fraxinifolium Schott simile, differt praesertim foliolis adultis superne nitidissimis apice acutissime acuminatis, ligno interiore primum albido demum flavido-brunnescente, fasciis longitudinalibus irregularibus insigniter ornato".

To the present writer A. lecointei has its nearest affinity in A. ulei. Steyermark 62871 is somewhat like A. graveolens in appearance.

Distribution: Venezuela and the upper Amazon drainage of Brazil.

Common names: "Misionero", "Miracoatiara", "Muiraquatiara".

Specimens examined: VENEZUELA: BOLIVAR: La Prisión en el medio Río Caura, 120 m. alt., "uno de los árboles mas altos que se encuentra en el medio Caura, a menudo alcanza a 40 metros de altura", 30 March 1939, Williams 11655 (F, US, VEN); SUCRE: dry rocky Chaparral near Quetepe, alt. 30 m., 23 May 1945, Steyermark 62871 (F, LIL); BRAZIL: PARÁ: Obidos, 27 Sept. 1915, Ducke & LeCointe 15756 (G, MG) and Oct. 1918, 1756 (G); Obidos, 23 Jan. 1918, Ducke s.n. (MG), 19 Oct. 1919, 11390 (S) and 20 Oct. 1919, 11390 (G, US); ad orientem lacus Salgade prope fluminis Trebetas, "arbor magna, in silvis", 23 Oct. 1919, Ducke 8 (G, S, US); circa cataratas Mangabal en el Río Tapajoz, 8 Aug. 1923, Ducke 18162 (S, US), and Río Tapajoz, 13 Aug. 1923, 18161 (G, S, US); AMAZONAS: Manaus: Estrada do Aleixo, 17 June 1932, Ducke 24814 (S, US), (fruiting) 14 Oct. 1941, 852 (BEL, F, MG, NY, US) and (flowering) 18 Dec. 1941, 852 (BEL, F, US); Jose-Assu, 19 Sept. 1932, Ducke 24816 (S); Codajas: Lago de Bedajos, 26 Aug. 1950, Froes s.n. (BEL).

2a. Astronium lecointei var. tomentosum (Matt.) Barkl., n. stat.: Astronium LeCointei f. tomentosum Mattick, Berlin Bot. Gard. Notizblatt 11: 1007. 1934.

Similar to the species but with petiole, petiolules, and veins minutely tomentose-pilose.

Type: Brazil: Para: Belém do Pará, 14 Nov. 1915, A. Ducke 15813 in the Delessert Herbarium at Geneva, Switzerland.

Common name: "Muiracoatiara".

Known only from the type collection.

Specimens examined: BRAZIL: PARÁ: Belém do Pará, 14 Nov. 1915, Ducke 15813 (G, US).

3. Astronium glaziovii Mattick, Berlin Bot. Gard. Notizblatt 11: 1007. 1934.

Branches terete, glabrous or at first densely holosericeous-pilose; leaves imparipinnate with 14 to 27 leaflets, the petiole angulate or very narrowly margined between the leaflets, at first sparsely pilose, the segments 8 to 15 mm. long; leaflets subsessile to petiolulate on petiolules to 1 mm. long, usually subopposite, 12



PLATE III. Photograph of Astronium lecointei Ducke from Ducke 8 in the Berlin Herbarium. Note the shape of the fruit. (Photo courtesy of the Field Museum of Natural History, Chicago.)

to 20 cm. long, .6 to 1 cm. broad, ovate-oblong to rhomboidal, oblique, the halves unequal, the margin crenate-serrate, the veins at least at first sparsely pilose; panicles 10-15 cm. long, narrow, shortly and sparsely pilose; bracts .5 mm. long, deltoid-lanceolate, acuminate, sparsely pilose, caducous; calyx 1.2 mm. long, ovate, obtuse, glabrous; petals 2 mm. long, glabrous, ovate, obtuse; calyx in fruit ovate-lanceolate, obtuse, 1.2 cm. long, 2 to 5 mm. broad; ovary 1 cm. long, 2 mm. broad.

The original description of this species (Mattick, Berlin Bot. Gard. Notizblatt 11: 1007. 1934.) was: "Ramuli teretes, novelli dense holosericeo-pilosi. Folia impari-pinnata 8-12-juga, 12-15 cm longa, petiolis angulatis vel inter foliola anguste marginatis, pilosis, interjugis 8-10 mm longis. Foliola petiolulis 0,5-1 mm longis, opposita vel parum alterna, 15-20 mm longa, 6-8 mm lata, ovato-oblonga, obliqua latere ad basin folii verso angustiore, margine crenato-serrato, in petiolulo, costa et venis praecipue supra leviter pilosula. Flores masculi desunt. Paniculae fructiferae 12-15 cm longae et latae, pyramidatae, brevissime pilosae, ramulis patentibus. Calycis fructiferi segmenta quam petala 5-6 ies longiora retreflexa, 11-13 mm longa, 4-5 mm lata. Petala oblonga 2 mm longa, 1 mm lata. Fructus elongate-oblongus acutatus 9-11 mm longus, 2-2.5 mm crassus."

Type: BRAZIL: MINAS GERAËS: Glaziou 19011 in the Royal Botanical Garden Herbarium, Kew.

Distribution: Minas Geraës to Rio de Janeiro, Brazil.

Specimens examined: BRAZIL: 29 May 1866, Allemão s.n. (R); MINAS GERAËS: 20 Dec. 1939, Heringer 263 (F, SP); RIO DE JANEIRO: Morro dos Cabritos: Lagoa Rodriog de Freitas, 27 Aug. 1939, Kuhlman s.n. (F, RB); Morro de Sacopan: Lagoa Rodriguez de Freitas, 30 Nov. 1939, Kuhlman 6023 (F, RB).

4. Astronium obliquum Friseb., Fl. Brit. W. Ind. 176. 1864; Engler in DC. Monog. Phaner. 4: 453. 1883; Mattick, Berlin Bot. Gard. Notizblatt 11: 997. 1934.

Tree of 7 meters; leaves about 20 cm. long, imparipinnately compound, with about 7 to 9 leaflets; leaflets glabrous, ovate lanceolate, 3.5 to 6.5 cm. long, 2 to 3 cm. broad, acuminate or subacuminate at apex, cuneate and (in the case of the lateral leaflets) very unequal at base, shortly petiolulate; rachis segments 2-3 cm. long, glabrous;

petiole glabrous, 4-5 cm. long; sepals orbicular, about 1 mm. in diameter, glabrous or in fruit about 1.2 cm. long; petals obovate, 1.5-2 mm. long, 1 mm. broad.

Type: Trinidad: in silvis montiem septentrionatum Crueger 289 from the Grisebach Herbarium in the Herbarium of the Berlin Botanical Garden.

This species, apparently very distinctive, but related to A. graveolens, is limited in distribution to the island of Trinidad. Good fruiting material nor good staminate flowering material have not been available for my study.

Common name: "Yoke".

Specimens examined: TRINIDAD: Scotland Bay, tree of 7 meters, on coastal hillside, 12 April 1920, Britton & Hazen 1706 (GH, NY, US); Botanic Gardens, 7 March 1925, Broadway 5577 (GH, S).

5. Astronium gracile Engler, Bot. Jahrb. 1: 45. 1881.

Astronium gracile f. serratum Mattick, Berlin Bot. Gard. Notizblatt 11: 999. 1934.

Tree; branches coarse, glabrous; leaves thin, imparipinnately compound with about 13 leaflets; leaflets glabrous, thin, oblong-lanceolate to oblong-ovate, 1.5 to 4 cm. broad, 4.5 to 9 cm. long, abruptly acute, subserrate to serrate, broadly cuneate to subcordate at base, petiolule 3 to 4 mm. long; inflorescence a terminal thyrsus and panicles at the uppermost nodes; sepals rotund, obtuse, glabrous, 1 mm. long; petals ovate, obtuse, glabrous, 2 mm. long; anthers oval, 1 mm. long; filaments slender, 1.5 mm. long; sepals in fruit oblanceolate, 1.2 mm. long, 4 mm. broad, rounded at the apex, ovary in fruit fusiform, 1.2 mm. long, 4 mm. broad.

Type: Engler originally cited two specimens from the De Candolle Herbarium in Geneva: Balansa 2527 and Casarette 552. The present writer having studied (presumably all of) the specimens from the Institut de Botanique Systématique de l'Université de Genève saw neither of these specimens. Mattick cited both of the specimens but only from the Berlin Herbarium which has since been destroyed. Engler

in 1883 in the De Candolle Monographs cites the above two specimens and additionally Glaziou 9390, also from the De Candolle Herbarium. Mattick cites this from both the De Candolle Herbarium and Berlin, and there are duplicates in at least three other herbaria. There having been no type designated previously the author believes that the specimen best considered typical for the species is: Brazil: Rio de Janeiro: entre Gavea et Tijuca, 10 Agosto 1877 (1879?), Glaziou 9390 in the De Candolle Herbarium of the Institut de Botanique Systematique de l'Universit  de Gen ve.

From the specimens examined the forma serratum of Mattick seems to be within the range of variation of the typical variety. The specimens from Par  and Acre, Brazil, are atypical, the latter may be referable to A. fraxinifolium but are too fragmentary to be certain.

Distribution: Acre, Par  and Minas Gera s, Brazil, to central Paraguay.

Common names: "Urundej-it ", "Urundey-m ", "Urundeh-par ", "Urundey-par ", "Urundel", "Urundey", "Ubat o", "Ubatan", "Muiracotiara branca", "Gibat o", "Chibatan", "Jeguira".

Specimens examined: BRAZIL: ACRE: Rio Yaco, 11 Aug. 1933, Krukoff 5398 (G, K, UC, US); Rio Acre, Sept. 1911, Ule 9551 (K, G); PAR : Tapajez: Boa Vista, 8 Aug. 1932, Capucho 369 (BEL, F, MG), 12 Aug. 1932, 372 (BEL, F), 16 Aug. 1932, 380 (F), and 17 Aug. 1932, Capucho 385 (BEL, F); Obidos, 26 July 1921, Ducke s.n. (MG), 4 Jan. 1916, s.n. (MG), Monte Alegre, 18 Sept. 1916, s.n. (MG), and Rio Tapajos, 28 Aug. 1916, Ducke s.n. (MG); MINAS GERAES: Guillemin 469 (NY); RIO DE JANEIRO: Aug. 1921, Campos 10519 (LP, US); entre Gavea et Tijuca, 10 Aug. 1877 (1879?), Glaziou 9390 (F, G, R, S, US); Aug. 1921, Occhioni 10519 (S); Sept. 1941, Tatto 18 (US); RIO ACRE: Monte Alegre, Sept. 1911, Ule 9551 (MG); S O PAULO: Botucatu: Fazenda Lageado, 13 June 1938, Hoehne & Gehrt s.n. (SP); Amparo: Monte Alegre, 5 April 1943, Kuhleman 576 (SP); PARAGUAY: CONCEPCI N: Aug. 1933, Rojas 6182a (BEL, LIL); CARAGUATAY: 12 Oct. 1902, Fiebrig 256 (F, G, LP); San Bernardino cerca la Laguna Ypecarai, 9 Sept. 1916, Osten & Rojas 9008 (S), 12 Sept. 1916, 9009 (BAF); Oct. 1943, Rojas 10641a (BEL, LIL); Oct. 1943, Pavetti & Rojas 10641a (LP); PARAGUARI: Cerro Hu (Yhu?), 7 Sept. 1916, Osten & Rojas 9010 (S).

5a. Astronium gracile var. acuminatum (Chodat & Hassler) Barkl.

n. stat.; Astronium gracile f. acuminatum Chodat & Hassler, Bull. Herb.

Boiss. 1: 67. 1903.

Tree; branches coarse, glabrous; the leaves imparipinnately compound with about 9 leaflets; leaflets thickly membranaceous, usually glabrous but at first sometimes finely pilose on the veins, oblong lanceolate, obscurely but finely serrate, the smaller veins very prominent, acuminate at apex; sepals rotund, obtuse, glabrous, 1.3 mm. long in the staminate flowers; petals ovate, obtuse, glabrous, 2.2 mm. long; fruit with sepals oblanceolate and obtuse, 12 mm. long, 4 mm. broad; the ovary in fruit 1.2 cm. long, .4 cm. in diameter.

This variety seems to the present writer to be intermediate between A. gracile and A. fraxinifolium var. glabra. Its leaflets are more acuminate, somewhat thicker, and the veinlets are more prominent than that in the typical variety.

Type: Paraguay: "Arbor excelsa 10-25 m. diam. .5-1.2 m. petala flavescentia, in silvis in collibus pr. Tobaty", Sept., Hassler 6224, in the Hassler Herbarium of the Institut de Botanique Systématique de l'Université de Genève (duplicate in the Delessart Herbarium of the same institute).

Known only from the type region.

Specimens examined: PARAGUAY: CARAGUATAY: In regione collium, Cordillera Centralis, Cerros de Tobaty, Sept. 1900, Hassler 6224 (G--TYPE, UC) and 6624 (G); Cordillera de Altos, Aug. 1898, Hassler 3142 (G).

6. Astronium fraxinifolium Schott in Sprengel, (Linn.) Syst. Veg. (VI) 2: 404. 1827.

Astronium graveolens var. brasiliensis Engler in Martius & Eichler, Flora Brasil. 12²: 399. 1876.

Astronium fraxinifolium f. mollissimum Mattick, Berlin Bot. Gard. Notizblatt. 11: 1004. 1934.

Tree; the branches pilose or subpilose; leaves imparipinnately compound with 7 to 11 leaflets, the rachis and petiole pilose; leaflets ovate, acute to acuminate at apex, 7-12 cm. long, 3.5-6 cm. broad, entire, pilose on the veins above (sometimes sparsely so), pilose below, densely so on the veins, base subcordate to rounded, shortly petiolulate;

the inflorescence a terminal thyrsus with or without additional panicles in the axils of the uppermost leaves, the axis sparsely pilose (rarely subglabrous or densely pilose); pedicels 1 mm. long in flower, enlarging to 5-6 mm. in fruit, sparsely pilose; sepals suborbicular, glabrous, about 1 mm. in diameter, or in the pistillate flower longer and growing rapidly; petals obovate, about 1 mm. broad, 1.5-2 mm. long, obtuse, glabrous; stamens with anthers ovate, about 1 mm. long, filaments about 1.5 mm. long; fruit with calyx lobes oblanceolate, rounded subacute, 1.2 cm. long, 3-4 mm. broad, glabrous, petals 1.8 mm. long, obtuse, glabrous, the ovary 1.1 cm. long, 2.5 mm. in diameter.

Type: Schott of course did not designate a type and if his specimen exists it has not been cited by Engler nor Mattick. The present writer considers Blanchet 2765 as seen from the Boissier Herbarium of the Institut de Botanique Systématique de l'Université de Genève as typical of the species.

The original description of Henrici Schott in his Fasciculus Plantarum Brasiliensium in Curtio Sprengel's Caroli Linnaei, Systema Vegetabilium (ed. 6) of 1827, p. 404, was: "15. Astronium fraxinifolium Schott. A. foliis pinnatis hirsutiusculis, foliolis 6-8 jugis lanceolatis acuminatis serratis, paniculis ♀ erectis. In corolla ♂ nectarium 10 lobum, in ♀ staminodia 5 erecta, antheris sterilibus minutis."

The typical variety of the species is widespread and variable both as to shape and size of the leaflets and in pubescence both of leaflet and inflorescence axis; as here interpreted the branchlets below the inflorescence are always pilose.

Common names: "Arantha", "Aroeira", "Aroeira do Campo", "Gongalo Alves", "Gonzaleiro", "Gonzales do mato", "Guarita", "Quebracho", "Quebrahache", "Sete-caracas".

Distribution: Central Brazil and eastern Bolivia.

Specimens examined: VENEZUELA: CARABOBO: Valencia, 400 to 800 m. alt., 8 Dec. 1919, Pittier 8679 (GH); BRAZIL: Etinga sur de Rio St. Francisco, 1838, Blanchet 2765 (G--Isotype of A. fraxinifolium f.

pilosum Matt.); Glaziou s.n. (SU); Rio San Antonio, Zehntner 407 (R), and Santa Rita, Oct. 1917, 369 (R); CEARA: Allemão s.n. (R); 23 Sept. 1860, Allemão y Cysneiros 324 (R); Nov. 1838, Gardner 1535 (G, NY, US) and 1839 (GH); PERNAMBUCO: Tapera, 23 June 1933, Pickel 3250 (US); MINAS GERAES: Claussen s.n. (G, NY) and 1878, 473 (G); Sierra da Mantiqueira, 22 Sept. 1877, Glaziou 10490 (R); Ituiutaba, 6 Aug. 1944, Macedo 439 (SP); Bella Horizonte, 14 Nov. 1939, Mello 10230 (R); MATTO GROSSO: July 1892, Kuntze s.n. (NY); Cuyaba, 3 Sept. 1902, Malme 1918a (R, S) and 23 June 1903, 1918b (S); BOLIVIA: SANTA CRUZ: Sara: Campo del Río La Perdiz, 450 m. alt., 26 Aug. 1916, Steinbach 2717 (LIL) and bosques en la region Buena Vista, 450 m. alt., 19 Nov. 1924, 6693 (BA, F, G, LIL, S).

6a. Astronium fraxinifolium var. glabrum Engler in DC. Monog. Phaner. 4: 455. 1883.

Astronium fraxinifolium f. subglabrum Mattick, Berlin Bot. Gart. Notizblatt 11: 1004. 1934.

Astronium fraxinifolium f. glaberrimum Mattick, Berlin Bot. Gart. Notizblatt 11: 1005. 1934.

Tree with branches slender, glabrous or subglabrous; leaves imparipinnately compound with about 7 to 9 leaflets; leaflets ovate, subcordate to rounded at the base, acuminate at apex, glabrous, sparsely pilose on the veins; the inflorescence a terminal thyrsus or with panicles in the axils of the uppermost leaves; pedicels about 2 to 3 mm. long, glabrous; sepals orbicular, 1 by 1 mm., glabrous; petals obovate, glabrous, 1 by 1.5 to 2 mm.; stamens with anthers oval, 1 mm. long, filaments somewhat thickened below, 1.5-2 mm. long; fruit with sepals oblanceolate, subacute, 1.1 cm. long, glabrous, the petals in fruit about 1.8 mm. long, glabrous, ovary 1.5 mm. thick, 1.1 cm. long.

Type: BRAZIL: RIO DE JANEIRO: Glaziou 12542 (G).

Mattick in his monograph has separated two forms from amongst the glabrous and subglabrous members of this complex. To the present writer there is no reason to separate these forms since they merge into one another. Whether the separation between the typical variety and the present one is justified is a matter of opinion, and even though this variety is connected to the typical variety by some intermediates it seems to me better to separate the two. The problem is complicated by the lack of sufficient collections of staminate,

pistillate and fruiting materials over a great portion of its range. Until much more adequate collections are available, the exact separation between these varieties and this species with Astronium graveolens must remain a problem, as A. graveolens var. inodorum is separable from this variety with difficulty in their region of common distribution. A. gracile var. acuminatum is intermediate between this variety and typical A. gracile.

On his specimen of 1899 from Colombia, H. H. Smith says: "The leaves collected in January, the flowers from the same tree in February the 16th.; this is a common tree of the dry forest below 1200 ft.; grows to 40 and 50 feet, the leaves nearly always have 5 to 7 leaflets".

Common names: "Alejandro macho", "Cuchi-blanco", "Gongeleiro branco", "Quebracho", "Urunday", "Urundei-pará".

Distribution: From Colombia to Central Brazil, Eastern Bolivia and Paraguay.

Specimens cited: COLOMBIA: ATLANTICO: Casacoima: 150-180 m. alt., "tree of 18-20 meters tall,....leaves aromatic", 9 June 1936, Dugand 1041 (COL, F); MAGDALENA: Molino, 250 m. alt., 29 Mar. 1944, Haught 4032 (COL); Santa Marta, "tree to 40 ft., common in dry forest below 1000 ft.,.... the buds are dark purple", 1898-1899, Smith 908 (COL, F, NY), Santa Marta, Sept. 1898, 823 (NY), road to Agua Dulce, 50 m. alt., 16 Jan. 1899, 910 (GH, NY), and Santa Marta, 50 m. alt., Feb. 1901, 910 (COL, F, G, S--Isotypes of A. fraxinifolium f. glaberrimum Matt.); CUNDINAMARCA: Tocoima, 16 July 1934, Perez s.n. (COL); BRAZIL: CEARÁ: Baturite, 30 Aug. 1908, Ducke s.n. (MG); MINAS GERAES: entre Sitie and Barbacena, 4 Aug. 1879, Glaziou 12942 (F); Bello Horizonte, Fazed da Cachoeira, 11 July 1935, Mello 1543 (R); RIO DE JANEIRO: Ponta Vegea, 6 Sept. 1931, Brade 11068 (F, R); 1882, Glaziou 12542 (G--Type of A. fraxinifolium var. glabra Engler and isotype of A. fraxinifolium f. subglabrum Matt.); MATTO GROSSO: Cuyaba, 3 Sept. 1902, Malme 1918 (S); BOLIVIA: EL BENI: Trinidad: Misiones Guarayes, 250 m. alt., Sept. 1926, Werdermann 2488 (S); SANTA CRUZ: Buena Vista, 450 m. alt., Aug. 1915, Steinbach 1570 (GH, LIL, NY); Sara: bosque del Río Surutu, 450 m. alt., 21 Oct. 1917, Steinbach 3532 (G, LIL, NY, US); PARAGUAY: Cañadon Platanillos de Chaco Paraguay, Aug. 1934, Rojas 7012 (LP); CONCEPCIÓN: Prope Concepcion, Aug. 1901, Hassler 7151 (G, UC); CARAGUATAY: Cordillera de Altos, Aug. 1895, Hassler 867 (G), Cordillera de Altos, Aug., 3142 (G, UC) and Monte Cieve-cua prope San Bernardino, Aug., Hassler 1898 (G) and 1898a (G);

San Bernardino, 12 Sept. 1916, Osten 9009 (LIL); PARAGUARI: Prope Sapucay, Oct. 1913, Hassler 11898 (G, US) and 11898a (F, G, UC, US).

7. Astronium graveolens Jacq., Select. Stirp. Amer. Hist. Linn. Syst. Deter. 261. 1763; De Candolle, Prodr. syst. nat. reg. veg. 2: 65. 1825; Engler in DC. Monogr. Phaner. 4: 454. 1883; Mattick, Berlin Bot. Gart. Notizblatt 11: 999. 1934.

Tree; branches grayish brown, glabrous; leaves imparipinnately compound with about 11 leaflets, about 20 cm. long; leaflets oblong or oblong-ovate, 2-3 cm. wide, 5-6 cm. long, abruptly subacute, obscurely crenate-serrate, the terminal subcuneate, the lateral obtuse and markedly assymetrical at the base, glabrous; petiolules 5 mm. long in the basal leaflets, progressively shorter above, except terminal about 8 mm. long, glabrous; rachis segments 2-2.5 cm. long; petiole about 4.5 cm. long, glabrous; inflorescences produced at the ultimate nodes of the branches, the flower buds covered with caducous, brown, glabrous cataphylls 2-3 mm. long, one subtending each of the main branches of the panicle; pedicels glabrous, 1-2 mm. long; subtended by caducous, deltoid bracts; sepals glabrous, rounded obtuse, 1 mm. long, sometimes slightly narrower; petals 2.5 cm. long, 1.2 cm. wide, oblong, rounded-obtuse; filaments slender, 2 mm. long, anthers oblong, 1.2 mm. long, .5 mm. broad; disk thin, shallowly five-lobed, 1.3 mm. in diameter; pistil rudimentary; or in the pistillate flowers the sepals enlarging rapidly, and the pistil large, stigmas hemispherical, styles 3, very short; fruit oblong-cylindric, 1.3 cm. long, acute at apex and base, petals persistent but not enlarging in fruit, the sepals enlarging in fruit, glabrous, lanceolate, rounded obtuse at apex, narrowed at base, 1.3 cm. long, 4 mm. wide.

Type: In regni Novo-Granatensis silvaticis ad Cartagena et Santa Martha, Bertero 2638.

This species was formerly thought to occur in Jamaica and Colombia, but the writer feels this original citation for Jamaica may have been in error. The type of the species is from Colombia and the species continues with individuals having somewhat smaller leaflets northward

to southern Mexico. Several variants occur which seem worthy of varietal rank.

Common names: "Copaiva", "Diomate", "Gateado", "Gongalo Alves", "Gonzaleiro", "Guzanero", "Palo de Cera", "Palo de Culebra", "Palo de Gateado", "Palomulato", "Palo Obrero", "Quebracho", "Quebrahacha", "Ronrón", "Tibigaro", "Yomate", "Zarro", "Zorro".

Distribution: Southern Mexico to Venezuela and Peru, but the specimens from Central America and Mexico vary toward the appearance of Astronium conzattii.

Specimens examined: MEXICO: YUCATAN: Gaumer 582 (F, G, NY, UPS, US), Izamal, 1895, 584 (F, US), 1917-1921, 24170 (F, G, US) and 1917-1921, Gaumer 24171 (G); April 1917, Gaumer & Sons 23772 (F, G, US); CENTRAL AMERICA: GUATEMALA: Peten: La Libertad and vicinity, 13 May 1934, Aguilar 327 (F, GH, MICH); EL SALVADOR: La Union: road near La Union, 15 Feb. 1946, Carlson 664 (F, UC); San Marcos: Lempa, 1924, Calderon 2153 (US); Sensonate: San Julian, "furnishes good wood", 1924, Calderon 2216 (NY, GH, US); BRITISH HONDURAS: Crique Negra, 24 May 1929, Stevenson 102 (F) and 27 Mar. 1929, 107 (F); HONDURAS: Yoro: Progreso, 30 m. alt., "tree of 25 ft.", 24 Jan. 1928, Standley 55063 (F, GH, US); PANAMA: Panama: around Alhajuela, 30-100 m. alt., 25 May 1911, Pittier 3730 (US); COLOMBIA: 1760-1808, Mutis 4431 (US); ATLANTICO: Megua, 20 kms. de Barranquilla, April 1935, Elias 1305 (F, G, US); BOLIVAR: Loba: Estrella, Caño Papayal, 1916, Curran 354 (F, GH); BOYACA: 1150 m. alt., 1932, Guevara 380 (US); CAUCA: El Tambo, 1800 m. alt., 6 Dec. 1936, von Sneider 1262 (F, GH); VENEZUELA: GUARICO: on plaza at El Sombrero, "tree, leafless at anthesis; flowers yellowish green", 19 Feb. 1924, Pittier 11435 (GH, NY, US); PORTUGUESA: Agua Blanco, 24 April 1948, Turner 138 (F); PERU: SAN MARTIN: Zepelacio, 1100-1200 m. alt., Oct.-Nov. 1933, Klug 3254 (GH).

7a. Astronium graveolens var. inodorum Triana & Planchon, Ann. Soc. Nat. V, 14: 288. 1872.

Astronium graveolens var. Planchonianum Engler in Martius & Eichler, Flora Brasil 12: 399. 1876.

Tree, the branches pilose or sparsely pilose; leaves compound with 7 (5 to 9) leaflets; leaflets ovate, obscurely serrate, abruptly acuminate, rounded obtuse at base, sparsely pilose except pilose on veins, 7-10 cm. long, 3-4.5 cm. wide; rachis segments pilose, about 3 cm. long; petiole pilose, about 4 cm. long; panicles produced from scale covered buds at the uppermost nodes, glabrous, 2-18 cm. long.

Type: Vallés de Magdalena (Colombia), Triana.

This variety, itself variable, lies between what the present writer interprets at the typical variety and Astronium fraxinifolium.

Triana & Planchon say the variety is odorless. Dugand describes one of his collections as follows: "tree 10-18 m. high, with a cylindrical, almost straight trunk not exceeding but often 50 cm. in diam. It is at once recognized by the bark, of a dark-gray color showing abundant patches of a buffy-gray color; the crown is usually elongated and the leaves aromatic".

Common names: "Diomate", "Gateado", "Quebracha", "Quebra Hacha".

Distribution: Venezuela and the Valley of the Magdalena River of Colombia.

Specimens examined: COLOMBIA: TOLIMA: Mariquita, 300-1200 m. alt., 1851-1857, Triana s.n. (US); ATLANTICO: Puerto Colombia, "desprovisto de hojas durante la inflorescencia", Jan. 1937, Elias 15041 (F); road from Malambo to Sabanagrande, "small tree 6-7 meters high", 3 July 1932, Dugand 1059 (F); BOLIVAR: Cartagena, 30 July 1943, Dugand & Jaramillo 3422 (COL); MAGDALENA: Santa Marta region, 1931, Espina 61 (F); Don Jaca, "smooth dark brown bark, wood hard", 20 Jan. 1930, Record 63 (F, NY); Santa Marta, 150 m. alt., Jan. 1901, Smith 908 (G, S, US); VENEZUELA: PORTUGUESA: Agua Blanca, 24 April 1948, Turner 145 (F).

7b. Astronium graveolens var. dugandii Barkl., n. var.

Speciei simile, sed foliola ovatoria, minus numerosa; folia subglabra.

Tree 10 to 15 meters tall, the branches tannish; the leaves with about 7 leaflets, the leaflets glabrous or with very few hairs on the midveins below, ovate, inequalateral, abruptly acuminate at the apex, subobtusate, the margins subentire to obscurely serrate, 5.5 to 8.5 cm. long, 2.5 to 4.5 cm. broad, petiolules about 3 mm. long, subglabrate; the inflorescences panicles, produced in the uppermost nodes after leaves have fallen, the lateral panicles in the bud subtended by a rotund, caducous, glabrous except marginally ciliate bract, the smaller branchlets subtended by small oblanceolate bracts (the larger bracts 3 mm. long, 2.5 mm. broad, the smaller ones 3 mm. long, 2 mm. broad and the smallest 1.5 mm. long, .4 mm. broad); pedicels slender,

3 to 5 mm. long, glabrous; the sepals glabrous, 1 mm. long, .8 mm. broad; the petals obovate, glabrous, persistent in fruit, 2 mm. long, 1.2 mm. broad; the filament slender, 2 mm. long, anther .8 mm. long, .4 mm. broad, oval; the sepals in fruit oblanceolate, glabrous, 1.1 cm. long, 3.5 mm. broad.

Type: Colombia: Atlántico: along Arroyo Bañón, 100 m. alt., 14 May 1936, A. Dugand 918 in the phanerogamic herbarium of the Chicago Natural History Museum.

This variety seems to be intermediate between Astronium graveolens and A. fraxinifolium var. glabra.

Common names: "Quebracho", "Quebracho Blanco", "Quebracho Morado", "Santacruz".

Distribution: Barranquilla region of Colombia.

Specimens examined: COLOMBIA: ATLANTICO: Bohórquez region near Giralda, 1933, --- 493: 157 (F); along arroyo Bañón, 100 m. alt., "common tree, 10-15 meters, dark gray bark with lighter blotches", 14 May 1936, Dugand 918 (F--Type) and between Arroyo de Piedras and Luruaco, 4 May 1936, 977 (F) and 978 (F); 100-200 m. alt., 25 Feb. 1936, Dugand & Mina 939 (F); BOLIVAR: Corozal, Corregimiento Palmitas, 25 Aug. 1944, Gutierrez 18 (COL) and 34 (COL); MAGDALANA: Banda, 100 a 200 m. alt., Feb. 1948, Romero 698 (COL).

8. Astronium konzattii Blake, Contr. Gray Herb. n.s. 53: 59. 1918.

Astronium zongolica Reko, El Mexico Antiguo 1: 157. 1918.

Tree with glabrous branches; leaves imparipinnately compound with about 9 leaflets; leaflets ovate-lanceolate, acuminate, rounded obtuse at base, obscurely serrate, very sparsely pilose, 1.5-2.5 cm. broad, 3-6 cm. long; petiolules minutely pilose, about 5 mm. long, rachis segments minutely pilose, about 2 cm. long; petiole minutely pilose about 4.5 cm. long; thyrsus or terminal panicles produced from the uppermost nodes of the branches, the axis glabrous; sepals (of the staminate flowers) orbicular, .5 mm. in diameter, glabrous; petals obovate, rotund-glabrous, 1 mm. broad, 1.5 mm. long.

Type: Mexico: Oaxaca: Pochutla: Capital Concordia, 600 m. alt., April 1917, Konzatti, Reko & Makrinus 3051 in the Gray Herbarium of

Harvard University.

This species is very similar to some of the specimens of Astronium graveolens, and it perhaps should have been treated as a variety of the species, however it seems best to treat it as a distinct species.

Common names: "Gateado", "Zongalia", "Zongalica".

Distribution: Southern Mexico and adjacent Central America.

Specimens examined: MEXICO: OAXACA: Pochutla: 600 m. alt., 10 April 1917, Conzatti, Reko & Makrinus 3051 (GH--Type, MEXU); Mena, 20 Jan. 1927, Mell 6 (US) and s.n. (NY); Cafetal Concordia, 400-650 m. alt., 1-15 April 1933, Morton & Makrinus 2436 (F, MICH, US) and 2601 (F, MICH, US); Cafetal Concordia, 1917, Reko 4192 (US); GUERRERO: near Acapulco, 15 Feb. 1921, Gamon 19 (US); CENTRAL AMERICA: BRITISH HONDURAS: El Cayo: Limestone hill near Valentin, June-July 1936, Lundell 6339 (F, MICH, NY).

8a. Astronium conzattii var. lundellii Barkl., n. var.

Speciei simile, sed foliola brevius acuminata, minus acute serrata et infra velutino-pilosa.

Tree; branches terete, slender, at first subglabrous; leaves imparipinnately compound with about 7 to 9 leaflets, 15 to 20 cm. long, leaflets subserrate lanceolate, acuminate at apex, obtuse at base, finely pilose above, velvety pilose below, 1.5-2.5 cm. broad, 4.5-7.5 cm. long, petiolules about 3 mm. long, finely pilose; inflorescence a terminal thyrus and panicles in the axils of the uppermost leaves; fruit with calyx lobes oblanceolate, rounded obtuse, glabrous, 3 mm. broad, 1.2 cm. long, petals 1.8 mm. long, obtuse, ovary 1.2 cm. long, 3 mm. in diameter.

Type: Guatemala: Peten: La Libertad, 19 April 1933, C. L. Lundell 2881 in the United States National Herbarium.

This variety is similar to the typical variety except is much more pilose. The two specimens from Costa Rica may represent a distinct variety, but unfortunately the specimens were recalled from loan before their study could be completed.

Distribution: Guatemala and Costa Rica.

Specimens examined: CENTRAL AMERICA: GUATEMALA: Petén: Chicbul:

La Libertad, 19 April 1933, Lundell 2881 (F, G, MICH, S, US) and 29 April 1933, 3095 (F, MICH, US); COSTA RICA: entre los rios Pilas y Tacares en la carretera de Alajuela a Grecia, 22 Oct. 1933, Brenes 43 (F) and camino de Canás a Tilacan Guanacaste, 28 June 1930, s.n. (F).

8b. Astronium conzattii var. standleyi Barkl., n. var.

Speciei simile, sed foliola longiora, acutius serrata, generaliter longius acuminata, fere glabra.

Tree with glabrous branches; leaves imparipinnately compound with leaflets 15-19; leaflets lanceolate, long acuminate, subcuneate to rounded at the base, 1.5-2.5 cm. broad, 5-9 cm. long, finely serrate, glabrous or very finely and sparsely pilose; shortly petiolulate, finely pilose on petiolules about 4 mm. long; rachis segments subglabrous (microscopically very sparsely pilose), about 3 cm. long; petiole about 6 cm. long, glabrous.

Type: Central America: Panama: Near Matías Hernández, 30 Dec. 1923, Standley 28942 (US).

The author has seen neither flowering nor fruiting material of this widely distributed variety. It seems most similar to the somewhat pubescent var. conzattii.

Distribution from Mexico through Panamá to Venezuela.

Specimens examined: MEXICO: VERA CRUZ: Fortuño: Coatzacoalcos River, 3050 m. alt., March 1937, Williams 8753 (F); CHIAPAS: Cacaluta: Escuintla, 24 Feb. 1947, Matuda 1645 (F) and 15 April 1947, 16518 (F, MEXU); OAXACA: Usumazin, Valle Nacional, 150 m. alt., 1919, Reko 4192 (US); Choapan: Monte Negro de Lalma, 150 m. alt., 3 May 1939, Schultes & Reko 769 (MEXU); Ubero, 30-90 m. alt., June 1937, Williams 9517 (F); YUCATAN: 1917-1921, Gaumer 24171 (F, US); CENTRAL AMERICA: GUATEMALA: Alta Verapaz: woods southeast of Finca Valpemech, 100-150 m. alt., 'tall forest tree with very fine wood with yellow and brown grain; this specimen from a sapling', 23 March 1942, Steyermark 4520 (F); Chiquimula: 4-6 miles north of Chiquimula between Santa Barbara and Petapila, 22 Oct. 1939, Steyermark 30268 (F); Quebrada Shusko above Chiquimula, 480 m. alt., 14 Oct. 1940, Standley 74308 (F); Guatemala: Aguilar 634 (F); Huehuetenango: Paso del Boqueron along Río Trapichillo below La Libertad, 1200-1300 m. alt., 21 Aug. 1942, Steyermark 51167 (F); Izabal: vicinity of Quirigua, 75-225 m. alt., 15-el May 1922, Standley 23947 (US); between Bananera and "La Presa" in Montaña del Mico, 40-300 m. alt., 28 March 1940, Steyermark 38094 (F) and 38145 (F); Peten: forest between Finca Valpemech along Río San Diego and San Diego on Río Cancuen, 50-150 m. alt., 25 March 1942,

Steevermark 45306 (F, GH), along Río Machaquila north of El Cambio, 75-100 m. alt., 25 April 1942, s.n. (F), and Cerro Ceibal (Chorro Ceibal, Sierra Mojada, or Cerro San Martín) between mouth of Río Santa Monica and mouth of Río San Martín, 75-150 m. alt., 30 April 1942, Steevermark 46117 (F); Zapaca: along Río Teculatan above Teculatan, 250-275 m. alt., 7 Jan. 1942, Steevermark 42144 (F); Solola: south facing slopes of Volcan Atitlán, 1700-3800 m. alt., 11 June 1942, Steevermark 47338 (F); EL SALVADOR: Ahuachapán: near Salto de Atehucia, 600 m. alt., "dry forested hillside", 22 Jan. 1947, Standley & Padilla 2865 (F); Santa Ana: vicinity of Metapán, 370 m. alt., "small tree on dry, rocky, bushy hillside", 29 Jan.-1 Febr. 1947, Standley & Padilla 3218 (F); HONDURAS: Atlantida: Lancetilla Valley near Tela, 20-600 m. alt., 6 Dec.-20 March 1927, Standley 53883 (F, GH, US), 53984 (F, GH, US), 54065 (F, GH), and 54680 (F, GH, US); Comayagua: vicinity of Comayagua, 600 m. alt., 12-23 March 1947, Standley & Chacoon 5767 (F); Copán: La Frarcia, 6 May 1919, Whitford & Stadtmiller 20 (US); Santa Barbara: near Jutiapa, 180 m. alt., 16 April 1947, Standley & Londell 7287 (F); Yoro: near Progreso, 26 March 1929, Hottle 22 (F); near Progreso, 24 Jan. 1928, Standley 55097 (F, GH, US); COSTA RICA: Guanacaste: vicinity of Libano, 260-360 m. alt., 15 Jan. 1926, Standley & Valerio 44916 (US); PANAMA: Canal Zone: Barro Colorado Island, 15 Nov. 1931, Shattuck 632 (F) and 20 March 1932, 866 (F); Río Pedro Miguel near East Paraiso, 7 Jan. 1924, Standley 29951 (US); Panamá: Río Tapia, 7 Dec. 1923-11 Jan. 1924, Standley 26183 (US), near Matías Hernández, 30 Dec. 1923, 28942 (US--Type); Río Tocumen, 3 Jan. 1924, 29377 (US), and Juan Díaz, 11 Jan. 1924, Standley 30550 (US); South Darien: El Real de Santa María, June 1914, Pittier 6997 (US); Camarca del Barú, 100 ft. elev., 15 June 1957, Stern & Chambers 129 (GH); COLOMBIA: BOLIVAR: Landas de Loba: San Martín de Loba and vicinity, April-May, 1916, Curran 188 (US); BOYACA: Valley of Río Negro, Guaguaquí, 170 m. alt., 14 July 1917, Whitford & Pinzon 15 (GH); MAGDALENA: Tucurínca, 100 a 200 m. alt., Dec. 1947, Romero s.n. (COL); VENEZUELA: CARABOBO: vicinity of Las Trincheras near Valencia, 200-400 m. alt., 30 Dec. 1917, Pittier 7650 (US, VEN); GUARICO: 19 Feb. 1924, Pittier 11435 (G, VEN).

9. Astronium mirandai⁺ Barkl., n. sp.

Astronium fraxinifolium Standley, Contr. U. S. Nat. Herb. 23: 1671. 1926, pr. p.

Arbor; rami primum pilosi; folia impari-pinnata, 9-11 foliolis composita; foliola anguste ovata, acuminata, rotundata et in basi tantum inaequalia, dense pilosa, subserrata usque integra, breviter petiolulata; fructus glaber; sepala 12 mm longa 5 mm lata, late

+ Named for the late Dr. Faustino Miranda of Mexico.

oblanceolata; petala 1.5 mm longa, 8 mm lata; ovarium 12 mm longum, 2 mm latum, fusiforme.

Tree; branches brownish, pilose; leaves imparipinnately compound with about 9-11 leaflets; leaflets 6-11 cm. long, 2.6-3.3 cm. broad, narrowly ovate, acuminate, rounded and slightly unequal at base, densely pilose, subcrenulate-serrate to entire, shortly petiolulate on pilose petiolules 4 mm. long; inflorescence a terminal thyrsus about 20 cm. long, with or without panicles at the uppermost nodes, sparsely long pilose; sepals in fruit glabrous 12 mm. long, 5 mm. broad, broadly oblanceolate and obtuse at apex, the petals oblanceolate, glabrous, narrowed above, .8 mm. broad, 1.5 mm. long, the ovary fusiform, 1.2 cm. long, 2 mm. broad.

Type: Mexico: Vera Cruz: Remudadero, April 1922, C. A. Purpus 8761 in the Herbarium of the United States National Museum.

Known only from the type locality.

Specimens examined: MEXICO: VERA CRUZ: Remudadero, April 1922, Purpus 8761 (GH, NY, US--Type); Los Conejos, March 1935, Purpus 16429 (F, GH).

10. Astronium gardneri Mattick, Berlin Bot. Gart. Notizblatt 11: 1007. 1934.

Tree; branches terete, at first grayish brown, pilose, later glabrate and brown; leaves compound, pilose, with 5 to 9 leaflets; leaflets narrowly ovate or oblong ovate, subacute to acute at apex, obtuse at base and very unequal, entire; fruit 1.3 cm. long.

Mattick's original description for this species was: "Astronium Gardneri Mattick n. sp. Ramuli teretes, novelli dense flavide holosericeo-pilosi, demum glabri, purpurascentes. Folia imparipinnata, 2-4-juga, 8-12 cm longa, interjugis 1,5 ad 2 cm longis, petiolis et petiolulis dense et molliter holosericeis. Foliola petiolulis 2-3 mm longis, oblique ovata vel ovato-oblonga subacuta, integerrima, 2,5-4,5 cm longa, 1,5-2 cm lata, supra sparse, subtus praecipue in costa et venis subdense pilosula, nervis lateralibus 7-10 paulum prominulis. Paniculae quam folia longiores, 15-20 cm longae lataeque, pyramidatae, ramulis teretibus, imprimis rachi, minus ramulis lateralibus pilosulae. Flores masculi ignoti. Pedicelli fructus 1,5-2 cm longi. Calycis feminei fructiferi segmenta oblonga, quam petala sexies longiora,

10-12 mm longa, 3-4 mm lata. Petala ovalia, 2 mm longa, 1 mm lata. Fructus oblongo-acutus, laciniis calycinis auctas aequam, 10-12 mm longus, 3 mm crassus, apiculatus."

The author has examined the isotype from the New York Botanical Garden which shows immature leaves and has a few fruits. The leaves are very similar to those of A. urundeuva, but the fruit are typical of Euastronium.

Type: Brazil: Piahy: August 1839, Gardner 2520 in the Herbarium of the Royal Botanic Gardens, Kew.

Specimens examined: BRAZIL: Igreja Velha, 1841, Blanchet 3418 (NY); MARANHÃO: Barra do Corda, 20 July 1909, Lisboa s.n. (MG); Carolina, 30 July 1949, Murça & Black 1573a (BEL); MINAS GERAËS: Bello Horizonte, Carlos Prates, 17 Nov. 1941, Mendes 941 (BEL); PIAUHY: 1841, Gardner 2520 (GH, K).

II. Subgenus Myracrodruon (M. Fr. Allemão) Barkl., n. stat.

Myracrodruon M. Fr. Allemão, Trab. Bot. 1: 3. 1862; Engler in Martius & Eichler, Flora Brasil. 12²: 400. 1876.

Fruit oblong, apiculate, the mesocarp thickish and resinous, the calyx lobes are much longer than the ovary, the seed subreniform-orbicular.

This subgenus ranges from central Brazil to Bolivia, Paraguay and Argentina; its few species are comparatively well represented in herbaria and therefore present less problems taxonomically.

IIa. Section Eumyracrodruon, n. sect.

Myracrodruon M. Fr. Allemão, Trab. Bot. 1: 3. 1862.

Section Myracrodruon Engler in DC., Monog. Phaner. 4: 453. 1883, excl. A. concinnus and A. macrocalyx.

Fructus sphaericus, endocarpio osseo; sepala calycem circumdantia minus quam 1 cm. longa.

Fruit globose-spherical, endocarp long; calyx segments less than 1 cm. long.

This section consists of two species and a very distinctive variety, which are among the best known and easily recognizable of the genus.

11. Astronium urundeuva (Fr. All.) Engl., Bot. Jahrb. 1: 45. 1881; Mattick, Berlin Bot. Gart. Notizblatt. 11: 1009. 1934; Cabrera, Rev. Mus. La Plata n.s. 2: 46. 1938.

Myracrodruon Urundeuva M. Freire Allemão, in F. Fr. Allemão & M. Fr. Allemão, Trab. Comm. Sc. Expl. Bot. 1: 3. 1862; Engler in Martius & Eichler, Flora Brasil 12²: 400. 1876.

Astronium juglandifolium Griseb., Symb. ad Flor. Argent. 94. 1879.

A tree to about 25 meters, the young branches green, densely pilose, at length glabrate; leaves imparipinnately compound, leaflets 5 to 15, softly pubescent, the leaflets elliptical, narrowly ovate, or broadly lanceolate, subacute to acute at the apex, rarely obtuse, obtuse at base or rarely broadly cuneate, petiolules pilose, 2 to 4 mm. long, rachis segments pilose 1 to 2 cm. long, the petiole pilose, 3 to 4 cm. long; inflorescences panicles axillary to the uppermost leaves and usually produced after these leaves have fallen, 5 to 15 cm. long; bracts small, deltoid ovate, glabrous, caducous; the flowers sessile at anthesis; sepals spherical, glabrous except ciliolate on the margin, .4 mm. long, .5 mm. wide; petals ovate, glabrous or with 2 or 3 cilia on the margin, 1 mm. wide, 2 mm. long; the stamens in staminate flowers with slender filaments 2 mm. long, the anthers ovate, .7 mm. long, .3 mm. broad; the disk 5-lobed, the ovary rudimentary; (in the pistillate flowers the stamens slightly smaller, but the pistil ovoid, .3 mm. long, .2 mm. broad, the stigmas sessile;) in fruit the sepals enlarged, obovate, truncate, glabrous except a few cilia on the margin, 7 mm. long, 3 mm. wide; the fruit spherical, brownish black, about 4 mm. in diameter; exocarp thin and glabrous, adherent to the thin, resinous mesocarp which in turn is adherent to the rough bony endocarp; the seed 3.2 mm. broad, 3 mm. high, irregular in outline, lenticular, 1 mm. thick except in the region of two prominent protuberances 2 mm. thick.

Type: The author has interpreted Glaziov 12543 from Rio de Janeiro as the type of the species.



PLATE IV. Photograph of Astronium urundeuva (Fr. All.) Engler from Lorentz & Hieronymus 394 in the Geneva Herbarium. Note the shape of the fruit. (Photo courtesy of the Field Museum of Natural History, Chicago.)

This is a very characteristic tree with pilose leaves. The variety candollei is quite distinctive, yet appears as the glabrous equal of the species.

Common names: "Aroeira", "Aroeira preta", "Aroeira de Campo", "Chibatan", "Gibatão", "Sotocele", "Ubatan", "Ubatão", "Urindeuva", "Urundel", "Urundeuva", "Urundey", "Urundey-mi".

Distribution: coastal regions south of the Amazon in Brazil to Bolivia, Paraguay and northern Argentina.

Specimens examined: BRAZIL: Pará Barrado Corda, 20 July 1909, Aerojado 2459 (G); Brejão, Aug. 1912, Zehntner 319 (R); BAHIA: Catanga, 1906, Ule 7283 (G); CEARÁ: Allamão s.n. (R); Grunada, 6 July 1908, Ducke s.n. (MG), Baturite, 11 Sept. 1908, s.n. (MG) and Guaramiranga, 23 April 1909, Ducke s.n. (MG); MINAS GERAES: 1838, Claussen 473 (NY, S) and 1840, s.n. (G); entre Barbacena y Sitio, 4 August 1879, Glaziou 12943 (US); GOYAZ: Passa Tres a João Loba, 1894, Glaziou 20869 (F, G, S); Ituiutaba, 4 Aug. 1944, Macedo 457 (SP); Santa Luzia, Gorduras de Baiso, 15 Aug. 1942, Nestor s.n. (BEL); MATTO GROSSO: Corimba, 30 Aug. 1892, Kuntze s.n. (NY); ESPÍRITU SANTO: Leopoldina, Oct. 1917, von Luetzelburg 12001 (NY); RIO DE JANEIRO: Rio de Janeiro, 1882, Glaziou 12543 (G--Type?); SÃO PAULO: Corumbataty, July, Cepolla II-190 (R, SP); Bebedoura, June-July 1936, Jordão 301 (SP); Villamontes, 1924-1925, Pflanz 4085 (US); BOLÍVIA: Bermejo, 1500 m. alt., 23 Nov. 1903, Fiebrig 2198 (G, LP, S) and s.n. (US); Gran Chaco, Tatarenda, 19 March 1902, Fries 1409 (S, USO; Velasco, 300 m. alt., July 1892, Kuntze s.n. (NY); LA PAZ: S. Yungas: near Calisaya, basin of Rio Bopi, 1-22 July 1939, Krukoff 10259 (NY); SANTA CRUZ: Sara: Bosques del Lomerio, 450 m. alt., 20 Feb. 1926, Steinbach 7471 (BA, F, GH, LIL, NY, S); Urubé: Cercado, 450 m. alt., 15 Aug. 1927, Steinbach 7921 (F, GH, LIL, NY); PARAGUAY: Chaco Paraguayo, 21° lat., 1906, Fiebrig 1271 (G); 1932, Jorgensen 3902 (F, GH, NY, S, US); Chaco Paraguayo, Palmas Chicas, Dec. 1937, Rojas 7712 (LP); CARAGUATAY: Monte Cigrovo-cua, Aug. 1890, Hassler 1890 (G) and 1890a (G); CONCEPCIÓN: Prope Concepcion, Aug. 1901, Hassler 7215 (G); PARAGUARI: prope Sapucay, Oct. 1913, Hassler 11890 (G, UC, US) and 11890a (G, UC, US); ARGENTINA: JUJUY: quinta cerca Laguna de la Brea in silva densa, 10 Aug. 1901, Fries 456 (S); 13 Dec. 1906, Lillo 5277 (LIL) and cerca de la fonda de Bartolo, 24 Dec. 1906, 5279 (LIL); Oct. 1940, Schreiter 11381 (GH, LIL); Sierra de Calilegua, 750 m. alt., 14 Oct. 1927, Venturi 5417 (BAB, F, LIL, NY, SI, US) and Sierra Calilegua, 750 m. alt., 25 Oct. 1930, 10609 (SI); San Lorenzo: en selva alta, 25 Oct. 1890, Schulz 8170 (CORD); San Pedro: La Bajada, 100 m. alt., 10 Oct. 1932, Pastrana 9136 (LIL); cerro de San Pedro, 800 m. alt., 10 Oct. 1925, Schreiter 5018 (LIL) and 600 m. alt., 5 Oct. 1925, 5028 (LIL);

Sierra Sant Bárbara, 700 m. alt., 16 Oct. 1929, Venturi 9698 (GH, LP, NY, S, US), Cerro de San Pedro, 800 m. alt., 10 Sept. 1926, 5033 (GH, SI, UC, US pr.p.); San Pedro de Jujuy, 640 m. alt., "árbol de medio metro de diametro, 8 de altura que crece en los bosques", 20 Oct. 1930, Venturi 10632 (SI); Santa Barbara: Sierra de Santa Barbara, 3 Jan. 1911, Spegazzini 1490 (LP); SALTA: El Querucillal, Nov. 1937, Devoto & Rial s.n. (BABosq); Anta: Represa de Concha, finca El Yeso, 25 May 1946, Meyer 9871 (LIL); Cerro la Ronda, June 1934, Ragonese 318 (BA, F); Orán: Río Pescado, 26 Sept. 1946, Castiglioni & Tinto 2967 (BABosq), 27 Sept. 1946, 2968 (BABosq), 20 Sept. 1946, 2969 (BABosq), 19 Sept. 1946, 2970 (BABosq) and 27 Sept. 1946, Castiglioni & Tinto 2971 (BABosq); San Ignacio, 20 Aug. 1944, Claps 299 (LIL); Febr. 1916, Hauman (BA), and Febr. 1923, s.n. (BA); Embarcacion, April 1911, Jørgensen s.n. (BAB); 21 Febr. 1916, Lillo 18087 (LIL); Tabacal, 18 June 1873, Lorentz & Hieronymus s.n. (CORD), 16 Oct. 1873, 394 (CORD, G--Isotypes of A. juglandifolium Griseb.), Oct. 1873, 418 (CORD) and Oct. 1873, Lorentz & Hieronymus s.n. (CORD, UC); Campamente Y.P.F. Río Pescado, 420 m. alt., 26 Febr. 1943, Meyer 4886 (LIL, UC) and Tartagal, 2 Nov. 1947, Meyer 12663 (LIL); Río Piedras, 31 Nov. 1911, Rodriguez 133 (BA, FacCBA, LIL, SI); Tartagal, 500 m. alt., 1 Oct. 1925, Schreiter 28 (BA); Tartagal, 500 m. alt., Oct. 1940, 11380 (F, GH) and Schreiter 11382 (LIL); Tartagal (San Jorge), 24 July 1944, Schulz & Varela 5386 (LIL) and 5388 (LIL); Embarcacion, 22-23 Nov. 1909, Venturi 316 (LIL) and Tartagal, 500 m. alt., 1 Oct. 1926, 5043 (BA, F, GH, S, SI, US); Rivadavia: Río Tarija, Oct. 1938, Carmelich & Rial 366 (BABosq).

11a. Astronium urundeuva var. candollei (Engl.) Hassl. ex Mattick,

Berlin Bot. Gard. Natizblatt 11: 1011. 1934; Cabrera, Rev. Mus. La Plata n.s. 2: 47. 1938.

Astronium Candollei Engl., Bot. Jahrb. 1: 45. 1881; Engl. in DC. Monog. Phaner. 4: 458. 1883; Hassler & Chodat, Bull. Herb. Bois. II, 1: 68. 1903; Hassler & Chodat, Bull. Herb. Bois. 12: 300. 1903.

Tree; branches slender, grayish-brown, glabrous; leaves compound, 20 to 25 cm. long; leaflets 7 to 13, about 5 cm. long, about 2 cm. broad, glabrous except sparsely pubescent on the veins, acute at the apex, very finely serrate to subentire, except terminal unequally obtuse to subcuneate at apex, petiolulate with petiolules about 3 mm. long; panicles axillary to the uppermost leaves, 3 to 8 cm. long; flowers subsessile; sepals glabrous, obovate, .9 mm. long, .4 mm. broad; petals glabrous, 1.8 mm. long, 1 mm. broad; fruit spheroidal, 4 mm. in diameter, the calyx wings 6 mm. long, 3 mm. broad, obtuse.

Type: Paraguay: Paraguari: in silvis Cerro-Hú, Balansa 2528 in the De Candolle Herbarium of the Institut de Botanique Systématique de l'Université de Genève.

This variety is very similar to the typical variety except it is glabrous in all parts.

Common names: "Aroeira", "Urundei-mi".

Distribution: Paraguay and northern Argentina.

Specimens examined: PARAGUAY: Chaco septentrionalis, 1907, Fiebrig 1271 (G); CARAGUATAY: cerrito San Bernardino, Aug., Hassler 12202 (G, UC); PARAGUARI: Cerro Hu, 7 Oct. 1875, Balansa 2528 (G--Type) and Oct. 1881, 3265 (G); Prope Sapucay, Jan. 1913, Hassler 12202a (G, UC, US); ARGENTINA: JUJUY: Ledesma, El Sanjal, 17 April 1911, Lillo s.n. (LIL), 5 July 1911, 10789 (LIL) and 1 Nov. 1911, 10842 (GH, LIL); 17 April 1911, Stuckert 22341 (LIL); SALTA: Orán: Zanja Honda, Tartagal, 500 m. alt., 26 Jan. 1924, Schreiter 3390 (LIL, US), 1 Oct. 1925, 5028 (LIL) and Oct. 1940, Schreiter 11382 (LIL).

12. Astronium balansae Engl., Bot. Jahrb. 1: 45. 1881; Engl. in DC., Monog. Phaner. 4: 459. 1883; Mattick, Berlin Bot. Gard. Notizblatt 11: 1011. 1934; Cabrera, Rev. Mus. La Plata n.s. 2: 44. 1938.

Tree 5 to 15 meters tall with thin, glabrous, brownish branches; the leaves imparipinnately compound, 9 to 15 leaflets; leaflets glabrous, lanceolate, sometimes broadly so, acuminate at apex, broadly subcuneate at the base, finely and sharply serrate, darker above, 3-6 cm. long, .9-2.2 cm. broad, the petiolules slender, glabrous, .9 to 1.3 cm. long, rachis segments glabrous, slender, 2 to 4 cm. long, petiole glabrous, 4.5 to 7.5 cm. long; the inflorescence a terminal thyrsus or lateral panicle, these 8 to 12 cm. long, quite glabrous; bracts glabrous except glandular ciliate on the margin, deltoid-lanceolate, .6 mm. wide, 1 to 1.5 mm. long, caducuous; pedicels at first sparsely glandular pubescent, soon glabrous; sepals ovate, glabrous, obtuse, 1 mm. long, .8 mm. wide; the petals ovate to obovate, 2 mm. long, 1 mm. wide; the stamens shorter than the petals, filaments 1.1 mm. long, anthers oblong, .8 mm. long, .2 mm. broad;



PLATE V. Photograph of Astronium balansae Engler from Balansa 2526 in the Berlin Herbarium. Note the long petiolules and very assymetric leaflets. (Photo courtesy of the Field Museum of Natural History, Chicago.)

the pistil (in the staminate flowers) minute; the sepals in fruit obovate about 4 mm. long, 2.5 mm. wide, the filaments .5 mm. long, the disk 1 mm. in diameter; the fruit black, glabrous, spherical, 2.5 to 3 mm. in diameter.

Type: Paraguay: Paraguari: Cerro Peron, 13 Jan. 1876, B. Balansa 2526 in the De Candolle Herbarium of the Institute de Botanique Systématique de l'Université de Genève.

This species is a very striking one, in which the leaflets are long petiolulate and therefore easily recognizable from the other species.

Common names: "Curupach", "Pae Ferro", "Urundahy", "Urunday colorado", "Urunday-pardo", "Urunday-pita", "Urundeih-mí", "Urundel", "Urundey", "Urundey-pichai".

Distribution: northeastern Argentina and Paraguay.

Specimens examined: PARAGUAY: Corrientes, Jan. 1882, Balansa 3188 (G); 1833, Bonpland 497 (F); Puerto Yatayba, 14-15 Sept. 1928, Daguerre s.n. (BA); ENCARNACION: Encarnacion, Jan. 1944, Pavetti & Rojas 10931 (LP) and 10931a (LP); Combyreta, Jan. 1944, Rojas 10931 (LIL) and 10931a (LIL); FARAGUARI: Base du Cerro Peron, 13 Jan. 1876, Balansa 2526 (BAF, G--Type); Carapegua, Febr. 1919, Rojas 3460 (LIL, LP), 3460a (LIL); VILLETA: San Fernando, 4 May 1945, Rojas 12642 (AS, LIL); ARGENTINA: '97, Bonpland s.n. (RB); FORMOSA: Jan. 1918, Jorgensen 2056 (BA, GH, LIL, SI, US); Delicia, 8 Jan. 1947, Reales 127 (LIL); Sept. 1902, Villa s.n. (BAF); Formosa: Mojon de Fierro, 7 Jan. 1945, Krapovickas 1063 (LIL, SI); entre Fortín y Mojon de Fierro, 7 Jan. 1945, Ragones y Cozzo 1198 (BABosq); PIRANE: 12 Nov. 1945, Morel 339 (LIL) and Casco-Cue, 15 Febr. 1946, 984 (LIL, S); CHACO: Villa Formosa, 19 Mar. 1885, Kurtz 1570 (CORD); "hojas verde oscuro reluciente", Meyer 98 (SI); Colonia Pastoril, 23 Nov. 1938, Moloko 2458 (BABosq); km. 522, 15 Jan. 1945, Ragones & Cozzo 2591 (BABosq) and 2601 (BABosq), 16 Jan. 1945, 2606 (BABosq) and 17 Jan. 1945, Ragones & Cozzo 2588 (BABosq); Puesto Puente Nacional, 21 Jul. 1944, Rojas 11689 (LIL); RESISTENCIA: 28 Febr. 1908, Burco 18607 (G); Laguna Charale, 8 Jul. 1924, Castellanos s.n. (BA); vicinity of Barranqueras, 35-40 m. alt., 12 Nov.-15 Dec. 1913, Curran 20 (US), 55 (F, GH, NY, US), 380 (US) and Fortín Cardoso, June 1914, Curran 634 (F, LIL); 10 Mar. 1916, Lillo 18187 (LIL); Fortín Cardoso, 17 March 1947, Malvarez 1331 (LIL); entre Río Araza y Tiel, 55 m. alt., 16 May 1945, Meyer 9011 (GH, LIL); Barranqueras, 14 Nov. 1913, Muniez, Acevedo & Curran 20 (LIL), Resistencia, 15 Nov. 1913, 379 (BAB) and Fortín Cardoso, 15 Nov. 1913, Muniez, Acevedo & Curran 380 (LIL); Colonia Colonia Benitez, 15 Mar. 1940, Muñoz 1310 (BABosq); Resistencia,

28 Feb. 1908, Rojas 18 (CORD); Barranca Río Negro, 10 June 1944, Rojas 11580 (AS, GH, LIL) and Río Negro, 12 Aug. 1944, 11931 (AS, LIL); Colonia Benitez, Jan. 1928, Schulz 136 (BAB), Dec. 1929, 164 (BAF) and Dec. 1933, Schulz 844 (NY); RIO BERMEJO: Río de Oro, k. 140, 30. Aug. 1944, Rojas 12148 (AS, LIL); TAPENAGA: Cote Lai, Dec. 1942, Meyer 4729 (LIL); MISIONES: Mar. 1888, Niederlein s.n. (BA); Itaimbe, 5 Jan. 1935, Rodriguez 474 (BA); CAINGUAS: Puerto Rico, 29 Dec. 1947, Schwindt 518 (LIL); CANDELARIA: Cerro Corí, 200 m. alt., 27 Nov. 1949, Bertoni 4686 (LIL); entre Loreto y Santa Ana, 29 Jan. 1933, Gruner s.n. (LP, NY); Candelaria, 10 Feb. 1924, Hauman s.n. (BA); Santa Ana, Jan. 1900, Llamas s.n. (SI), 25 Feb. 1900, s.n. (SI), 1901, 45 (G), and 1907, Llamas s.n. (BAB); Loreto, 218 m. alt., 15 Dec. 1944, Montes 461f (LIL); 218 m. alt., 15 Feb. 1945, 559 (GH, LIL, S) and 4 Jan. 1943, Montes 54003 (BA); Santa Ana, 20 Sept. 1912, Rodriguez 635 (BA, BAF, LIL, NY, SI); CAPITAL: Posadas, 150 m. alt., 28 Dec. 1944, Bertoni 550 (LIL) and Zaiman, 28 Dec. 1945, 21539 (LIL); alrededores de Posadas, 6 Dec. 1947, Cozzo 117M (BA); Posadas, 2 Dec. 1912, Curran 17 (LIL), 2 Dec. 1913, 417 (BAB) and 5-7 Dec. 1913, Curran 17 (US); Posadas, 26 Sept. 1900, Gerling 6801 (BAB) and 6808 (BAB); Posadas, 2 Jan. 1911, Lillo 10587 (GH, LIL); Posadas, 25 Feb. 1944, Meyer 5824 (LIL), 16 Feb. 1944, 6005 (LIL) and 20 Jan. 1947, Meyer 11337 (LIL); Posadas, 12 Jan. 1907, Spegazzini s.n. (BAB) and 18 Jan. 1907, s.n. (BAB); SAN JAVIER: Aug. 1902, Burmeister 6807 (BAB); SAN IGNACIO: 1918, Denis 6 (BA); CORRIENTES: Capital: Corrientes, 26 Jan. 1944, Meyer 5900 (GH, LIL) and 24-28 Jan. 1944, 6635 (LIL); GENERAL PAZ: Ita Ibate, 11 Jan. 1946, Ibarrola 1058 (F, LIL, S); Ita Ibate, 22 Aug. 1922, Rojas 4334 (BAF) and Barranca Río Parana, 6 July 1944, Rojas 11540 (AS, LIL); SAN COSME: Paso de la Patria (Costa Toledo), 25 May 1945, Meyer 9003 (LIL); SANTO TOME: Feb. 1910, Venturi s.n. (LIL); SANTA FE: GENERAL OBLIGATO: entre Rabon y Florencia, 10 Jan. 1937, Castellanos s.n. (BA); entre Rabon y Florencia, 10 Jan. 1937, Ragonese 2413 (LP) and 12 Feb. 1938, 3240 (LP).

IIb. Section Macrocalyx, n. sect.

Fructus obconicus, endocarpio chartaceo; sepala fructum circum-
dantia quam 2 cm. maiora.

Fruit globose-obconical, endocarp chartaceous; calyx segments over 2 cm. long.

This section contains what has previously been considered two species, but what the present writer believes is a single, quite uniform species.

13. Astronium concinnum Schott in Spreng. Linn. Syst. Veg. (VI), 404. 1827.

Myracrodruon concinnum (Schott.) Engl. in Martius & Eichl., Flora Brasil 12²: 401. 1876.



PLATE VI. Photograph of Astronium concinnum Schott in Sprengel. From Schott 187 in the Berlin Herbarium. Note the very large fruits. (Photo courtesy of the Field Museum of Natural History, Chicago.)

Myracrodruon macrocalyx Engl. in Martius & Eichl., Flora Brasil
12²: 402. 1876.

Astronium macrocalyx Engl., Bot. Jahrb. 1: 45. 1881.

Tree; the branches brownish-green, later tannish-gray, glabrous; leaves with leaflets 3 to 7, glabrous, persistent, the leaflets ovate, acute or abruptly acuminate, the base rounded-obtuse, the lateral slightly inequalateral 2 to 4 cm. wide, 3.5 to 7 cm. long, the rachis segments 1.5 to 2.5 cm. long, petiolules 2 to 5 mm. long, petiole 2.5 to 4.5 cm. long; the inflorescence a terminal thyrsus or lateral panicle, in either case little-branched and a few-flowered, glabrous; pedicels short, glabrous; the bracts deltoid, .5 to 1.2 mm. long, .2 to .4 mm. broad, glabrous, caducuous; sepals semicircular in outline, .4 mm. long, .5 mm. broad, glabrous; petals obovate, obtuse, glabrous, 1.2 mm. long, 1 mm. broad; anthers ovoid, .4 mm. long, .2 mm. broad, filaments .3 mm. long; calyx lobes in fruit about 3 cm. long, 7 to 10 mm. broad, obtuse, the ovary in fruit 7 mm. in diameter, 5 mm. long except for the 3 mm. long style.

Type: Brazil: Rio de Janeiro, Schott in the Botanische Abteilung des Naturhistorische Museums von Wien.

While Astronium concinnum and A. macrocalyx have traditionally been kept separate, there are no really valid characters which can be used to distinguish the two, so it seems best to consider them as synonymous.

Common names: "Aroeira", "Aroeira do Mucury", "Aroeira rajada", "Chibatan", "Gibatão", "Guaribú", "Guraba preta", "Gurubú", "Ubatan", "Ubatão".

Distribution: Bahía and Río de Janeiro, Brazil.

Specimens examined: BRAZIL: Pohl 4557 (G); BAHIA: Blanchet s.n. (MG), Jacobina, 2556 (F, G--Type of Myracrodruon macrocalyx Engl.), Serra Jacobina, 1836, 2556 (G), and Sierra de Jacobina, 1839, Blanchet 2556 (NY); basin of Rio Pardo, Itombe, 4 Nov. 1942, Froes 12655 and Mata estrada Itatinga, 24 Nov. 1942, 20080 (BEL, NY); RIO DE JANEIRO: Garangairas (Cantagallo), 1887, Glaziou 15903 (F, G, MG, NY, R, RB) and 24 Nov. 1886, 15903 (US); Rio Sertas de Cacimbos, Sampaio 937 (R) and Rio Itabapirana, 939 (R); Schott 187 (13186) (F, US--photos of the Type); MINAS GERAES: Fazenda da Cachoeira, 18 July 1935, Mello 1654 (R).

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Allemão 11

TAXONOMIC NOTES ON SOME BROMELIACEAE OF ECUADOR¹

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During the preparation of the keys and descriptions representing a portion of the author's PhD dissertation, "The Bromeliaceae of Ecuador, An Alpha-Numerical Taxonomic Study," it became necessary to make some additions and taxonomic changes. The following is an effort to place these changes and additions on record for the convenience of other taxonomists pending publication of "The Bromeliaceae of Ecuador" in its entirety.

PUYA GLOMERIFERA Mez and Sodiro, 1904 (Bull. Herb. Boiss. series 2, vol. 4) p. 630. Puya asplundii L. B. Smith, 1959 (Phytologia vol. 6, no. 8) pp. 439-440, pl. 2, figs. 14, 15.

NOTES: Examination of the respective TYPE specimens of Puya glomerifera and of Puya asplundii, Sodiro P-2 (B, TYPE; US, photo) and Asplund 2022 (US, TYPE), and examination of other specimens, supports a 1-taxa circumscription. Smith (1964, Phytol. 19(6): 463) separated these two in his revision by the relative sizes of the floral bracts and sepals. Study of the foregoing specimens indicates that the relative lengths of the sepals and floral bracts is variable within the same individual. Therefore, I am reducing P. asplundii to taxonomic synonymy with P. glomerifera, noting that the species is variable as to sepal size, as to margins of the primary bracts and noting also that in maturity the pedicels may become apparent.

PUYA SODIROANA Mez, 1904 (Bull. Herb. Boiss. series 2, vol. 4) pp. 630-631; Smith, 1964 (Phytologia vol. 10, no. 6) pp. 460, 473. Puya gummiifera Mez and Sodiro, 1904 (Bull. Herb. Boiss. series 2, vol. 4) p. 863; Smith, 1964 (Phytologia vol. 10, no. 6) pp. 463, 473.

¹ I wish to express my sincere admiration of Dr. Lyman B. Smith, the monographer of the plant family, and my deep gratitude to him for his encouragement, valuable advice and criticism during the past six years.

NOTES: For the following reasons I am reducing Puya gummifera to taxonomic synonymy with Puya sodiroana. These two entities previously had been distinguished by the length of the stipe and by the length of the sepals. Examination of the photograph of the TYPE specimen of P. sodiroana, Sodirop P-5 (B, TYPE; US, photo), indicates that the sepals rather than being to 40 mm long as stated in Mez (1935, Pflanzenreich vol. 4, p. 300) do not exceed 2.6 cm at most. The TYPE specimen of Puya gummifera, Sodirop P-4 (B, TYPE; US, photo), agrees well with sodiroana. The stipes of the TYPE specimens of both these are 12-18 mm long.

PITCAIRNIA DENDROIDEA André, 1888 (Énumération Bromél.) p. 4; Smith, 1957 (Contrib. Nat. Herb. vol. 33) p. 43. Pitcairnia commixta L. B. Smith, 1949 (Contrib. U.S. Nat. Herb. vol. 29) p. 303. Pitcairnia orgyalis André ex Mez, 1896 (DC Monogr. Phaner. vol. 9) p. 412.

NOTES: The taxa, Pitcairnia dendroidea André and Pitcairnia commixta L. B. Smith, which are based on the TYPE specimens, André 3361 and André 3747 respectively, are to me indistinguishable. Since Pitc. dendroidea was published in 1888, this is the correct name for the species. The TYPE is André 3361 from Colombia rather than André 3747, the TYPE of Pitcairnia commixta, nomen nova for the illegitimate name, Pitcairnia orgyalis André ex Mez.

PITCAIRNIA PULCHELLA Mez var. XANTHOPETALON Gilmartin, var. nov.

A var. pulchella foliorum laminis latioribus, bracteis florigeris angustioribus, deciduis differt.

LEAF-BLADES 7-12 cm broad; FLORAL BRACTS with a conspicuous dark base having a transverse line along which the bracts are deciduous. This latter character shows that the new variety may have some affinity with Pitcairnia ferreyrae L. B. Smith. However, the sepal size relative to the floral bracts and the majority of its floral and vegetative characteristics indicate that this variety, xanthopetalon, is most closely allied to Pitcairnia pulchella.

TYPE in the Gray Herbarium, Penland and Summers 230 (GH, TYPE), collected along Canelos trail, near Hacienda Victoria, Prov. Tungurahua, 1° 25' south, 78° 10' west, 1230 m, March-August, 1939.

PITCAIRNIA SCEPTRIGERA Mez, 1906 (Fedde Repert., vol. 3) p. 7; Mez, 1935 (Pflanzenreich IV, fam.

32) p. 276. Pitcairnia campii L. B. Smith, 1952 (Memoirs, N.Y. Bot. Gard. vol. 8, no. 1) p. 28, fig. 1, j-k.

Pitcairnia campii, TYPE Camp E3661 (US), was distinguished from Pitcairnia sceptringera on the basis of the former possessing serrate petioles. Mez's description (Mez, 1935, Pflanzenreich IV, fam. 32, p. 276) of P. sceptringera indicates that the petioles are entire. However, examination of the ISO-TYPE, Eggers 15061 (F), and the photograph of the TYPE specimen of P. sceptringera, Eggers 15061 (B, TYPE; US, photo), shows that the petioles are serrate. It does not seem to be possible to distinguish the TYPE specimens of these two entities. Therefore, I am reducing P. campii L. B. Smith to taxonomic synonymy under the earlier P. sceptringera.

TILLANDSIA STENOURA Harms, 1935 (Notizblatt, Gart. und Mus. Berlin, vol. 12, no. 115) p. 537. Tillandsia arguta L. B. Smith, 1959 (Phytologia vol. 6, no. 8) pp. 440-441, pl. 2, figs. 16, 17.

NOTES: Because Tillandsia arguta L. B. Smith, Foster 2619 (US, TYPE), shows no significant differences from the previously described T. stenoura Harms, I am reducing T. arguta to taxonomic synonymy with T. stenoura. Had there been access earlier to the TYPE specimen of T. stenoura Harms, Diels 558 (B, TYPE; US, photo), undoubtedly T. arguta would not have been described. Some specimens deposited in the Berlin herbarium which had been thought lost, later turned up.

TILLANDSIA STENOURA Harms var. GONZALEZII Gilmartin, var. nov.

A var. stenoura inflorescentia tripinnata, spicis subsessilibus differt.

SCAPE ca. 1.0 cm in diameter; INFLORESCENCE tripinnate at least toward base, purple; BRANCHES with 1 to 2 collar-like sterile bracts at base; SPIKES subsessile; FLORAL BRACTS 2.7-3.0 cm long.

TYPE in the Gray Herbarium, Espinosa E 1412 (GH, TYPE), collected in the "paramos" west of Saraguro, about 50 km north of the town of Saraguro, Prov. Loja, 3° 5' south, 29° 14' west, 2500 m, 10 March 1947.

TILLANDSIA STENOURA Harms var. MAUROI Gilmartin, var. nov.

A var. stenoura, foliorum laminis angustioribus, inflorescentia gracili, bracteis florigeris longioribus, differt.

LEAVES somewhat triangular to lingulate, blade width 3.0-3.5 cm; INFLORESCENCE ca. 25 cm long and ca. 10 cm in diameter, bipinnate; SPIKES 5.0-10.0 cm long, erect; FLORAL BRACTS 3.0-3.5 cm long.

TYPE in the U.S. National Herbarium, AJG 1112 (US, TYPE), collected at km 40 Cuenca-Loja, epiphytic, moderately common, moist shrub-small trees, Prov. Azuay, 3° 7' south, 79° 4' west, 3000 m, 9 Aug. 1965.

TILLANDSIA BREVICAPSULA Gilmartin, spec. nov.

A T. denudata André, cui affinis, ramis ad 30 cm longis, capsulis brevioribus, differt.

PLANT probably at least 1 m tall; LEAVES ca. 46 cm long, blades 5.0-5.5 cm wide, lingulate, apex long-acute, punctulate, sheath 18-20 cm long by 9.0 cm wide, purple above; INFLORESCENCE probably ca. 50 cm long by ca. 30 cm in diameter, bipinnate, spikes laxly disposed, 3.0-4.0 cm between spikes, glabrous; PRIMARY BRACTS ca. 7.0-8.0 cm long, 2.0 cm wide, erect to spreading, apex attenuate; SCAPE 1.0-1.5 cm in diameter; SCAPE-BRACTS unknown; SPIKES to ca. 30 cm long by 2.0 cm wide at anthesis, ca. 3.5 cm wide at capsule maturity, spreading to recurved, with stipe ca. 10 cm long having 4 to 5 sterile bracts; FLORAL BRACTS 2.1-2.4 cm long by 1.5-1.6 cm wide, gently rounded dorsal surface, glabrous without, densely lepidote within, scarcely nerved, coriaceous, imbricate and erect at anthesis, spreading and not touching at capsule maturity, apex obtuse to cuspidate; SEPALS 2.0 cm long by 8 mm wide, ovate-elliptic, obtuse, posteriorly carinate, free, slightly nerved, glabrous without, lepidote within; PETALS at least 3.5 cm long; CAPSULE 2.2 cm long, not exceeding calyx, seeds dark brown, distance between flowers 7-8 mm.

TYPE in the U.S. National Herbarium, Firmin 652 (US, TYPE), collected in the Prov. of Pichincha, exact locality not known, probably ca. 2700 m, 3 Jan. 1929.

TILLANDSIA CLAVIGERA Mez, 1896 (DC. Monogr. Phaner. vol. 9) p. 783. Tillandsia deppeana Steudel var. clavigera (Mez) L. B. Smith, 1956 (Phytologia vol. 5) p. 395.

NOTES: The differences evident between T. clavigera Mez and T. fendleri Griseb. seem sufficient to set these two apart at the species level.

(Fendleri, according to Smith, 1965, Bromel. Soc. Bull. 15(1):4, is the correct epithet for south American specimens which had been placed in T. deppeana.) The floral bracts of T. clavigera do not exceed 3.5 cm in length, the sepals are not more than 3.0 cm long and the stipe is consistently longer than 1.0 cm and may be up to 15 cm long.

TILLANDSIA FENDLERI Griseb. var. REDUCTA (L. B. Smith) Gilmartin, comb. nov. Tillandsia deppeana var. reducta (L. B. Smith) L. Smith, 1956 (Phytologia vol. 5, no. 8) p. 395. Tillandsia rubra var. reducta L. B. Smith, 1951 (Fieldiana (Bot.) vol. 28) p. 151.

TILLANDSIA FENDLERI Griseb. var. NERVISEPALA Gilmartin, var. nov.

A var. fendleri sepalis nervatis, bracteis florigeris sepalisque brevioribus differt.

PLANT ca. 60 cm tall; LEAVES ca. 70 cm long, blades ca. 5.0 cm wide; INFLORESCENCE ca. 40 cm long by 30 cm in diameter; FLORAL BRACTS 2.6-2.7 cm long by 2.4 cm wide; SEPALS ca. 2.0 cm long by ca. 1.2 cm wide, obtuse, strongly nerved; CAPSULES 5.5-6.0 cm long, much exceeding calyx.

TYPE in the U.S. National Herbarium, Hitchcock 21443 (US, TYPE), collected between Loja and San Lucas, epiphytic, Prov. Loja, ca. 3° 44' south, 79° 16' west, 2100-2600 m, 6 Sept. 1923.

TILLANDSIA FOSTERI Gilmartin, spec. nov.

A Tillandsia wurdackii L. B. Smith, cui affinis, foliorum laminis latioribus, glabris, stipitibus ad 3.5 cm longis, bracteis vacuis ad 3 praeditis differt.

PLANT ca. 1.5 m tall by ca. 130 cm in diameter, rosette of spreading leaves; LEAVES 45-55 cm long, blades 6.0-7.5 cm wide, lingulate, purple-blotched, glabrous on both surfaces, apex acute, sheaths

17-20 cm long by 8-10 cm wide, purple in part, ovate, densely appressed-lepidote; SCAPE 1.3 cm in diameter, curved, much exceeded by leaves; SCAPE-BRACTS totally imbricate, foliaceous; INFLORESCENCE ca. 65 cm long by 8-10 cm wide, curved, lax, bipinnate, glabrous, having ca. 19 spikes; PRIMARY BRACTS 4.5-18.0 cm long by 3-4 cm wide, apex attenuate to caudate, spreading; SPIKES 9-10 cm long by 2.0-2.5 cm wide, some of the lower spikes with 6 to 8 apical small floral bracts having aborted flowers, spreading, distance between spikes 1.5-4.0 cm, stipe to 3.5 cm long, having 2 to 3 sterile bracts; FLORAL BRACTS 2.7-3.0 cm long by 2.1 cm wide, erect, imbricate, elliptic, glabrous, densely lepidote within, very obscurely nerved but still appearing smooth and lustrous, coriaceous, apex acute; SEPALS 2.1-2.5 cm long by 0.8 cm wide, elliptic, glabrous, densely lepidote within, acute, posteriorly carinate, posteriorly connate for 2-3 mm, obviously nerved; PETALS ca. 3.5 cm long, distance between flowers 6-7 mm; CAPSULES 3.0 cm long, not extending beyond the floral bracts.

TYPE in the U.S. National Herbarium, Foster 2625 (US, TYPE), collected between Oña and Saraguro, on ledges, Prov. Loja, ca. 2400 m, 4 Dec. 1948.

TILLANDSIA BUSERI Mez var. NUBICOLA Gilmartin, var. nov.

A var. buseri sepalis connatis latioribus differt.

INFLORESCENCE lax; SPIKES reflexed with ca. 7 to 10 flowers per spike; SEPALS 8 mm wide, usually posteriorly connate for 4-6 mm; PETALS ca. 3.5 cm long.

TYPE in the U.S. National Herbarium, Foster 2620 (US, TYPE), collected between Cuenca and Oña, cloud forest, epiphytic, Prov. Azuay, ca. 3000 m, 3 Dec. 1948.

TILLANDSIA ARCUANS L. B. Smith var. NAUNDORFFII Gilmartin, var. nov.

A var. arcuans partibus omnibus parvioribus, spicis angustioribus, sepalis chartaceis, differt.

LEAVES 25-35 cm long, blades 2.0-3.0 cm wide; SCAPE diameter to 1.0 cm; INFLORESCENCE ca. 7.0 cm in diameter; SPIKES to 9.0 cm long by 2.5 cm wide

at anthesis; FLORAL BRACTS 3.8-4.0 cm long by ca. 2.3 mm wide; SEPALS subcoriaceous; PETALS ca. 4.5 cm long; distance between flowers to 9 mm.

TYPE in the U.S. National Herbarium, Naundorff s. n. (US, TYPE), collected in quebrada near Quito, cultivated by Marnier-Lapostolle in France, Prov. Pichincha, 2800 m, 26 March 1963.

TILLANDSIA QUEROENSIS Gilmartin, spec. nov.

A T. orbicularis L. B. Smith atque T. sceptriformis Mez et Sodiro, cui afinis, caulibus elongatis, foliorum laminis triangulatis, spici filiformibus paucioribus differt.

PLANT 70 cm to 1 m tall including inflorescence, long-stemmed, growing in clumps of several individuals, terrestrial; LEAVES 30-45 cm long, blades 2.0-2.5 cm wide, narrowly triangular, densely appressed-lepidote, apex filiform, sheath ca. 10 cm long by 4.0-5.0 cm wide, dark brown; SCAPE 5-6 mm in diameter, curved, exceeding leaf-rosette; SCAPE-BRACTS 4-21 cm long by ca. 1.5 cm wide, erect, imbricate, red; INFLORESCENCE 10-24 cm long by 3.0-4.0 cm wide at anthesis, bipinnate, lax below, dense above, having 4 to 6 spikes, subglabrous; PRIMARY BRACTS 3.0-6.0 cm long by ca. 1.6 cm wide, erect, red, elliptic, apex acute to apiculate; SPIKES 5.5-7.0 cm long by ca. 1.5 cm wide at anthesis, erect, ca. 1.0-2.0 cm apart, having 5 to 9 flowers per spike, stipe minimal to 1.5 cm long with 1 to 2 sterile bracts; FLORAL BRACTS ca. 2.5 cm long by 1.2 cm wide, imbricate, erect, elliptic-ovate, red, ecarinate to slightly carinate, glabrous to moderately lepidote without, moderately lepidote within, nerved, apex broadly acute, coriaceous; SEPALS 1.7-2.2 cm long by ca. 6 mm wide, elliptic, erect, pink, carinate, connate for 1-5 mm, acute, strongly nerved, glabrous without, moderately lepidote within; PETALS 3.0-3.5 cm long, stamens included by 2-3 mm, distance between flowers 4-10 mm.

TYPE in the U.S. National Herbarium, AJG 1102 (US, TYPE), collected at km 18 Ambato-Cuenca near pueblo of Quero, terrestrial, common locally, steep, rocky slope, Prov. Tungurahua, 1° 23' south, 78° 36' west, ca. 2800 m, 8 Aug. 1965; 1101 AJG (US) same as AJG 1102, 8 Aug. 1965; Naundorff s. n. (US) valley of Azogues, cultivated by Marnier-Lapostolle in France, Prov.

Cañar, 2500 m, no date, probably 1966.

NOTES: The floral parts when dry bear some resemblance to T. incarnata H. B. K. However, the inflorescence is borne on a much thicker scape and is bipinnate, the floral bracts are broader, 1.0-1.3 cm wide, and the sepals are larger, 1.7-2.2 cm long and less connate, 3-5 mm, in T. queroensis than in T. incarnata. The colors of the live inflorescence are distinct, the floral bracts being red in T. queroensis and purple in T. incarnata. T. queroensis also has some resemblance to T. chartacea L. B. Smith. The primary bracts of T. queroensis, however, are much more conspicuous, being at least one-half as long as the few-flowered spikes; the spikes are much less complanate and the floral bracts are acute, not obtuse.

TILLANDSIA ACOSTA-SOLISII Gilmartin, spec. nov.

A T. cornuta Mez et Sodiro, cui affinis, bracteis florigeris longioribus erectis, sepalis nervatis differt.

PLANT 40-65 cm tall by ca. 25 cm in diameter, leaf-rosette elongate-erect, growing in clumps of several individuals; LEAVES 32-45 cm long, blades 1.0-2.0 cm wide, flat, papery when dry, narrowly triangular, apex attenuate to filiform, densely appressed-lepidote; sheath 3.0-7.0 cm long by 2.0-3.5 cm wide, concolorous with blade below, dark brown above; SCAPE 3-4 mm in diameter, erect; SCAPE-BRACTS 4.0-15.0 cm long by 1.0-1.2 cm wide, erect, sheaths clasping scape, caudate apices spreading, imbricate throughout; INFLORESCENCE 12-14 cm long by ca. 2.0 cm wide, simple, distichous, erect, linear-elliptic, glabrous, having 10 to 15 flowers, rhachis strongly geniculate; FLORAL BRACTS 2.5-3.0 cm long by 1.2-1.6 cm wide, erect in bud, erect to spreading after anthesis, ovate, glabrous without, pale-lepidote within, apex acute, subcarinate, slightly nerved; SEPALs 2.4-2.7 cm long by 6 mm wide, erect to spreading, acute, ovate with margins nearly straight, equally connate for 3-4 mm, posteriorly carinate, slightly nerved, glabrous without, lepidote within; PETALS 4.0-4.5 cm long, blades ca. 1.4 cm wide, erect, white; CAPSULE to 6.5 cm long, distance between flowers 0.1-1.2 cm.

TYPE in the U.S. National Herbarium, Teuscher 2275-56 (US, TYPE), collected east of Cuenca,

Dec. 1958; Acosta Solis 6139 (F), Charquiyacu, Prov. Bolivar, ca. 600 m, 4 Oct. 1943; AJG 1178 (US), Soroché, between El Tambo and Guayaquil, ca. 90 km from Guayaquil, epiphytic, 7-8 m from ground, cloud forest, Prov. Cañar, ca. 900 m, 14 Aug. 1965.

NOTES: T. acosta-solisii Gilmartin differs from T. cornuta Mez and Sodiro to which it bears the most resemblance, in the following ways. T. acosta-solisii has its 2.5-3.0 cm long floral bracts erect to spreading, its inflorescence 12-14 cm long and its sepals 2.4-2.7 cm long. T. cornuta has its 1.8 cm long floral bracts spreading at ca. 45° angle with the rhachis, its inflorescence is 10-12 cm long and its sepals are 1.8-2.1 cm long.

TILLANDSIA STRAMINEA H. B. K., 1816 (Nova Genera et Species, vol. 1) p. 292; Mez, 1935 (Pflanzenreich IV. Fam. 32) pp. 531-532.

NOTES: Although Mez (1935) placed Tillandsia straminea H. B. K. in the subgenus, Allardtia; its short style, and conspicuous petal blades would preclude its membership in Allardtia and justify its inclusion in the subgenus, Phytarrhiza. Smith (1954, Contrb. U.S. Herb. 29(11): 535) has mentioned the Phytarrhiza-like characteristics of T. straminea in notes on T. cacticola L. B. Smith. I am including T. straminea within the subgenus, Phytarrhiza.

TILLANDSIA NUBIS Gilmartin, spec. nov.

A T. dyeriana André, cui affinis, partibus omnibus minoribus, spicis angustioribus bracteis florigeris sepalis non superatis differt.

PLANT to 45 cm tall; LEAVES at least to 24 cm long, blades ca. 3.0-4.5 cm wide, lingulate, apex acute to apiculate, sheath ca. 9.0 cm long by 4.5-5.5 cm wide, pale brown, blade and sheath often with some purple when living; SCAPE 35-48 cm long with inflorescence, 3-4 mm in diameter; SCAPE-BRACTS 5.0-7.0 cm long, strict, imbricate below, scarcely so above; INFLORESCENCE ca. 24 cm long by ca. 1.3 cm in diameter, mostly bipinnate, may be partly tripinnate, lax, pyramidal, glabrous; PRIMARY BRACTS 2.5-4.0 cm long by 0.9-1.0 cm wide; SPIKES 6.0-9.0 cm long by ca. 3.0-4.0 cm wide, ascending, with stipe 1.4-3.0 cm long, no sterile bracts, having 8 to 14 flowers, spike rhachis nearly straight, distance between spikes 2.0-4.0 cm; FLORAL BRACTS 1.4-2.1 cm long by

8 mm wide, spreading at 75°-90° angle with rhachis at anthesis, carinate nerved, apex acute, apparently glabrous without and within, papery, not imbricate; SEPALs 1.5-1.8 cm long by 5-7 mm wide, about equaling floral bracts, broadly elliptic, coriaceous, glabrous without and within, acute to attenuate, not nerved, ecarinate; PETALS to 4.5 cm long, blades ca. 1.2 cm wide, violet; OVARY 2-3 mm long by 1.2 mm wide, style 1.0-1.5 mm long shorter than stamens, distance between flowers 4-6 mm, probable flowering time March-June.

TYPE in the U.S. National Herbarium, Naundorff s. n. (US, TYPE), Tandapi, "palma de pais," cultivated by Marnier Lapostolle no. 55, Prov. Pichincha, ca. 1500 m, 22 March 1966; AJG 1186 (US) cloud forest, road between Guayaquil and El Tambo, Prov. Cañar, ca. 920 m, 14 Aug. 1965.

NOTES: The resemblance of T. nubis Gilmartin to T. dyeriana André is strong and especially so if one does not take into consideration the dimensions of the floral parts. The spikes, for example, of T. dyeriana are at least 5.5 cm wide at anthesis and the spikes of T. nubis are not more than 3.0 cm wide at anthesis. An additional feature which distinguishes these two is the relative lengths of the sepals and floral bracts. The floral bracts of T. dyeriana conspicuously over-reach the sepals; the floral bracts of T. nubis are 1.4-2.1 cm long and are equal to or exceeded by the broadly elliptic sepals which are 1.5-1.8 cm long.

TILLANDSIA SINUOSA L. B. Smith var. QUIROZII Gilmartin, var. nov.

A var. sinuosa inflorescentia breviori spicis decurvatis differt.

Plant habit and most dimensions and shapes largely like T. sinuosa var. sinuosa. However, the plant is shorter, the inflorescence is to 7.0 cm long and the spikes rather than being ascending are recurved. The leaves are longer, to 30 cm long, and narrower. Floral bracts are 6-7 mm long; sepals are symmetric and broadly obovate.

TYPE in the U.S. National Herbarium, AJG 1176 (US, TYPE), collected near Monte Negro, between El Tambo and Guayaquil, cloud forest, Prov. Cañar, 2° 28' south, 79° 12' west, ca. 950 m, 14 Aug. 1965.

TILLANDSIA INSULARIS Mez var. LATILAMINA Gilmartin, var. nov.

A var. insularis foliorum vaginis violaceis, laminis latoribus, apicis adscendentibus, bracteis florigeris lepidotis differt.

Ample collections of Tillandsia insularis Mez have made it possible to distinguish two varieties. Variety latilamina has wider leaves, usually 4.3-7.0 cm wide at the blade, some purple is usually evident either on the sheath or blade or both, the outer surface of the floral bracts is lepidote, the spikes are usually ascending and, unlike the typical variety, the floral bracts may be slightly longer than the sepals.

TYPE in the U.S. National Herbarium, AJG 882 (US, TYPE) collected west of "Table Mountain," a flat-top mountain visible from Academy Bay on Isla Santa Cruz (Indefatigible) and east of a large crater, epiphytic on Scalesia, very common locally, 0° 40' south, 90° 16' west, ca. 400 m, 3 Feb. 1967; AJG 877 (US) El Occidente, west side of Isla Santa Cruz, ca. 6 km northwest of Bella Vista, ca. 0° 42' south, 90° 24' west, ca. 220 m, 28 Jan. 1964; AJG 878 (US); AJG 880 (US); and AJG 881 (US) same site and date as AJG 877; AJG 918 (US) M. Gilmartin, epiphytic, near Progreso, Isla San Cristóbal (Chatham), ca. 250 m, March 1964; Lund 1 (US) and Lund 2 (US) near Progreso, southwest side of Cerro José Herrera, Isla San Cristóbal, ca. 200 m, 26 Jan. 1965; Stewart 1117 (GH) above Wreck Bay, Isla San Cristóbal, ca. 170 m, 27 Jan. 1906; Stewart 1116 (GH) "common on bushes, small trees, among rocks in vegetable mold," Isla Floreana (Charles) ca. 400 m, 9 Oct. 1906; AJG 885 (US) ca. two-hour walk from Black Beach inland, Garcia-Wittmer farm, epiphytic on Inga "Guaba," Isla Floreana, ca. 240 m, 6 Feb. 1964; AJG 886 (US) epiphytic on Psidium "guayaba," common locally, Isla Floreana, ca. 300 m, 6 Feb. 1964; AJG 917 (US) epiphytic on Psidium "guayaba," common, near Garcia-Wittmer farm, Isla Floreana, ca. 240 m, 6 Feb. 1964; Itow 223 (DS) Scalesia forest, Isla Floreana, ca. 300 m, 17 Feb. 1964.

VRIESEA ESPINOSAE (L. B. Smith) Gilmartin, comb. nov.

Tillandsia espinosae L. B. Smith, 1951 (Contrib. U.S. Nat. Herb. vol. 29, no. 19) pp. 498-499, fig. 65, d, e.

NOTES: The petals of AJG 887 (US) clearly show basal scales indicating that the species belong in the genus, Vriesea. Although the description of the TYPE specimen, Espinosa E-1205 (GH, TYPE; US, photo and fragment) does not mention the stolons it is probable that the stolons simply were not collected. The other collections, Fagerlind and Wibom 617 (US), Rauh, Hirsch E 5, and AJG 887, all show the stolons between plants. The species seem to be restricted to xerophytic communities west of the Andes.

VRIESEA BARCLAYANA (Baker) L. B. Smith var. MINOR
Gilmartin, var. nov.

Tillandsia lateritia André, 1888 (Énumération Bromél.) p. 6; André, 1889 (Bromel. Andreanae) pp. 76-77, pl. 21; Mez, 1935 (Pflanzenreich IV. Fam. 32) p. 553, pro parte.

A var. barclayana partibus omnibus minoribus, ad 45 cm longis, inflorescentia breviori, bracteis florigeris 1.8-2.6 cm longis differt.

PLANT like the typical variety but smaller, 30-45 cm tall; INFLORESCENCE 5.0-12.0 cm long by 3.0-3.5 cm wide and having 9 to 18 flowers; FLORAL BRACTS 1.8-2.2 cm long.

TYPE in the Kew Herbarium, André 4057 (K, TYPE, type of T. lateritia) Sabanetas, at foot of Chimborazo, Prov. Bolivar, July 1876; Sodirol 171/26 (B; US, photo) near Sabanetas, Prov. Bolivar, July 1872; Camp E-3899 (US) between Naranjapata and Huigra, saxicolous, Rio Chanchan canyon, Prov. Chimborazo, 600-900 m, 19 June 1945; Hitchcock 21247 (US) epiphytic, on dry hill, Portovelo near Zaruma, Prov. El Oro, 600-1000 m, 30 Aug. - 1 Sept. 1923; AJG 863 (US) km 79 Guayaquil-El Tambo, Prov. Cañar, 2° 16' south, 79° 14' west, ca. km 79 Guayaquil-El Tambo, 21 Sept. 1963.

NOTES: The new variety minor Gilmartin of V. barclayana (Baker) L. B. Smith is probably related to geographical location, the smaller one being found somewhat inland. Possibly the two varieties may come together in Prov. El Oro in southwest Ecuador.

GUZMANIA SANGUINEA (André) Mez var. BREVI-PEDICELLATA
Gilmartin, var. nov.

A var. sanguinea folis angustioribus, bracteis florigeris brevioribus acutis subcucullatis pedicellis brevioribus differt.

LEAVES mostly not exceeding 20 cm in length, blades to 2.5 cm wide; FLORAL BRACTS to 2.2 cm long, acute, not at all abruptly acuminate; SEPALS to 1.7 cm long; FLOWERS visible from side of plant at anthesis; PETALS with lobes yellow or yellow with green apices.

TYPE in the U.S. National Herbarium, AJG 888 (US, TYPE) collected near km 97 Duran-El Tambo, wet forest, Prov. Cañar, ca. 2° 27' north, 79° 3' west, ca. 2100 m, 22 March 1964; Wagner s. n. (US) Prov. Chimborazo, ca. 1500 m, 1957(?); Teuscher s. n. (US) near town of Ducur, Cuenca-Guayaquil road, Prov. Cañar, ca. 1500 m, 1956(?); AJG 939 (US) epiphytic on "matapalo," cloud forest, 1 km east of Bucay, Prov. Chimborazo, ca. 300 m, 4 June 1962.

NOTES: The most outstanding distinction (but difficult to discern in dry material) between Guzmania sanguinea var. sanguinea and var. brevipedicellata lies in the shape of the floral bracts. The typical variety has its apex obtuse-apiculate, the tip decidedly drawn out, and there is no sign of the bract being cucullate. Variety brevipedicellata has its floral bracts with an acute apex, and tending to be cucullate.

GUZMANIA XANTHOBRACTEA Gilmartin, spec. nov.

A Guzmania amplexans L. B. Smith, cui affinis, scapo gracili, bracteis florigeris obtusis chartaceis, sepalis brevioribus acutis differt.

PLANT ca. 1 m tall, with well-developed "woody" base having many long fibrous "holdfasts"; LEAVES 80-110 cm long, blades 3.5-4.0 cm wide, linear-lingulate, apex attenuate, very inconspicuously lepidote, sheath ca. 9 cm long by 6.0 cm wide, dark brown; SCAPE not exceeding leaves, ca. 4 mm in diameter, curving; SCAPE-BRACTS 7.0-30.0 cm long by ca. 2.3 cm wide, erect, imbricate, apex attenuate to caudate; INFLORESCENCE 40-50 cm long by 15-20 cm in diameter, curving, yellow, subglabrous, bipinnate, lax; PRIMARY BRACTS 4.0-8.0 cm long, spreading to ascending, apex attenuate, red; SPIKES 10-14 cm long by 4.0-4.5 cm in diameter, obovate, ca. 5 to 10 spikes per inflorescence, ca. 4.0 cm apart, ascending, flowers per spike 9 to 15, stipe 0.8-2.5 cm long with 1 to 2 sterile bracts; FLORAL BRACTS 3.5-4.0 cm long by ca. 1.5 cm wide, obovate, apiculate, imbricate, strongly nerved, papery, punctulate without, glabrous within, yellow when living; SEPALS 2.0-2.2 cm long by 5 mm wide, acute, obovate, coriaceous, carinate, glabrous

without and within, connate equally for 5-7 mm; PETALS ca. 5.0 cm long, lobes green; OVARY 7-8 mm long by 2 mm in diameter, distance between flowers 4-5 mm.

TYPE in the U.S. National Herbarium, AJG 871 (US, TYPE), terrestrial, road-cut, ca. km 100 Guayaquil-El Tambo, Prov. Cañar, ca. 2° 30' south, 79° 7' west, ca. 1850 m, 16 Nov. 1963; Drew E-540 (US) epiphytic (?), above Garcia Moreno, above Rio Intag, near confluence of Rio Intag and Rio Quinde, Prov. Imbabura, 0° 16' north, 78° 38' west, 1530 m, 8 Sept. 1944.

GUZMANIA ECUADORENSIS Gilmartin, spec. nov.

A G. amplexanti L. B. Smith, cui affinis, inflorescentia tripinnata, sepalis longioribus bracteis florigeris excedentibus differt.

PLANT ca. 1 m tall; LEAVES ca. 1 m long, blades 6.0-7.0 cm wide, lingulate, apex pungent; SCAPE erect, 1.6 cm in diameter; SCAPE-BRACTS 8.0-15.0 cm long at least, imbricate, apex attenuate; INFLORESCENCE ca. 35 cm in diameter, tripinnate, lax, branches ca. 4.0 cm apart; PRIMARY BRACTS 6.0-9.0 cm long, apex attenuate, red; BRANCHES ca. 20 cm long by ca. 12 cm in diameter, having 1 to 3 secondary branches; SECONDARY BRANCHES 8.0-10.0 cm long by 4.0-5.0 cm wide, spreading to nodding, flowers per branch 8 to 12, stipe ca. 1.5 cm long; FLORAL BRACTS 2.4-2.6 cm long by 1.1 cm wide, ovate-elliptic, spreading to erect, not imbricate, strongly nerved, glabrous without, lepidote within, papery, apex obtuse; PEDICELS ca. 6 mm long; SEPALS 3.5-4.0 cm long by ca. 4 mm wide, linear, obtuse, coriaceous, mostly ecarinate, spreading to erect, glabrous without and within; PETALS ca. 5.0 cm long, lobes ca. 7 mm wide, yellow when alive, stamens and stigma included equally by ca. 5 mm.

TYPE in the Field Museum of Natural History, Acosta Solis 6219 (F, TYPE), collected near Osoloma, road to Tablas, Prov. Bolivar, 2500 m, 7 Oct. 1943.

NOTES: Guzmania ecuadorensis differs from G. amplexans L. B. Smith in the sepals which greatly exceed the floral bracts and in the well-developed tripinnate inflorescence, as well as having sepals which are to 4.0 cm long and largely ecarinate. It differs from G. xanthobracteata Gilmartin in the tripinnate inflorescence and also the size of the sepals.

AECHMEA ANDRADEI Gilmartin, spec. nov.

A Aechmea abbreviata L. B. Smith, cui affinis, foliorum laminis brevioribus, marginibus armatioribus; bracteis florigeris amplioribus differt.

PLANT 30-50 cm tall; LEAVES 15-35 cm long, blades ca. 5.0 cm wide, margins serrate, spines ca. 4 mm long, sheaths ca. 7.0 cm long by 5.0 cm wide, densely lepidote below; SCAPE ca. 1 mm in diameter, curving, exceeding leaf-rosette; SCAPE-BRACTS ca. 2.8 cm long, erect, not imbricate, entire; INFLORESCENCE ca. 4.0 cm long by 3.0 cm in diameter, bipinnate, having ca. 4 spikes, lax, axis flocculose; PRIMARY BRACTS to 3.5 cm long, red, margins entire; SPIKES ca. 1.4 cm long with 2 to 3 flowers, spreading; FLORAL BRACTS ca. 7 mm long, broadly ovate, distichous, entire, green toward base, red toward apex, lepidote; SEPALS 5.5 mm long, asymmetric, nerved, yellow; PETALS ca. 5 mm long, yellow when alive, bearing fimbriate basal scales; OVARY ca. 5 mm long, distance between flowers 5-6 mm.

TYPE in the U.S. National Herbarium, AJG 870 (US), collected ca. 125 km west of Santo Domingo, road to Exmeraldas, terrestrial, Prov. Esmeraldas, ca. 0° 30' north, 79° 27' west, ca. 50 m, 11 Oct. 1963.

NOTES: Aechmea andradei bears some resemblance to Aechmea abbreviata L. B. Smith. However the size and configuration of the floral bracts as well as the much shorter and broader leaves, and the greater degree of spineyness of the leaf-blades distinguish it. It superficially resembles Aechmea angustifolia Poeppig and Endlicher. However, the much smaller size of the plant, shorter and bipinnate inflorescence, and the longer floral bracts, are some of the characters which help to distinguish it from this latter species.

GUZMANIA ELONGATA Mez and Sodiro, 1905 (Bull. Herb. Boiss., series 2, vol. 5) p. 115; Smith 1932, p. 31; Diels 1938, p. 143. Guzmania drewii L. B. Smith, 1954 (Contrib. U.S. Nat. Herb. vol. 29, no. 11) pp. 526-527, fig. 82.

NOTES: Comparison of the type specimen photograph of G. elongata, Sodiro 171/44 (B., TYPE; US, photo) with the type specimen of G. drewii L. B. Smith, Drew E-198 (US), does not uphold any distinction between these two taxa; therefore, the latter described, G. drewii is being reduced here to taxonomic synonymy in G. elongata.

ADDITIONAL NOTES ON THE GENUS BAILLONIA. II

Harold N. Moldenke

BAILLONIA Bocq.

Additional synonymy: Baillonia "Bocq. ex Baill." apud Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 113. 1966.

Additional & emended bibliography: Bocq., Adansonia 2: 89, 109, 127, 130, 142, 146, & 147 (1862) and 3: 184, 185, 246--247, & 251, pl. 7. 1863; Bocq., Rev. Verbenac. 89, 109, 127, 130, 142, 146, 147, 184, 185, 246--247, & 251, pl. 7. 1863; Reiche, Fl. Chile 5: 303. 1910; C. K. Schneid., Ill. Handb. Laubholz. 590. 1911; M. Kunz, Anatom. Untersuch. Verb. 37. 1911; Hérissé, Compt. Rend. Acad. Sci. Paris 179: 1419--1420. 1924; Hérissé, Bull. Soc. Chim. Biol. 7: 195--201. 1925; Hérissé, Journ. Pharm. & Chim., ser. 8, 1: 208--215. 1925; Angely, Cat. Estat. Gen. Bot. Fan. 17: 3. 1956; Angely, Fl. Paran. 7: 4. 1957; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14354. 1958; Angely, Liv. Gen. Bot. Bras. 35 & 39. 1960; Moldenke, Biol. Abstr. 36: 2311. 1961; Runner, Rep. G. W. Groff Coll. 361. 1961; Hocking, Excerpt. Bot. A.6: 532. 1963; Moldenke, Phytologia 12: 6. 1965; F. A. Barkley, List Ord. Fam. Anthoph. 75 & 143. 1965; Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 113. 1966.

BAILLONIA AMABILIS Bocq.

Additional bibliography: M. Kunz, Anatom. Untersuch. Verb. 37. 1911; Moldenke, Phytologia 7: 344. 1961; Hocking, Excerpt. Bot. A.6: 532. 1963.

Additional & emended citations: PARAGUAY: Hassler 2638a (Ca--950429); Kuntze s.n. [Puerto Esperanza, IX.92, 3 m.] (W--700971), s.n. [P. Esperanza, Sept. 1892, 1 m.] (F--297637); Edw. Palmer s.n. [1853--6] (W--57342). BOLIVIA: Santa Cruz: Kuntze s.n. [West-Velasco, 200 m., VII.92] (F--297117).

BAILLONIA AMABILIS var. PUBESCENS Moldenke

Additional bibliography: Moldenke, Phytologia 7: 344--345. 1961; Hocking, Excerpt. Bot. A.6: 532. 1963.

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CERTAMEN MELASTOMATACEIS XII.

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Dept. of Botany, U. S. National Museum

TIBOUCHINA INOPINATA Wurdack, sp. nov.

Sect. Lepidotae. A sectionis congeneribus differt floribus minoribus.

Ramuli obscure quadrangulati sicut petioli foliorum subtus venae primariae inflorescentia hypanthiaque modice pilis appressis squamatis ovato-lanceatis inconspicue eroso-ciliolatis (0.3-)0.5-1(-2) X 0.4-0.6 mm obsiti. Petioli 0.5-1 cm longi; lamina 5-8 X 1.5-2 cm anguste elliptica apice anguste gradatimque acuminato basi anguste acuta, rigidiuscula et integra, supra pilis ca. 1 mm longis et ca. 3/4 adnatis appressis sparsiuscule induta, subtus in superficie squamis plerumque 0.3-0.5 mm longis sparsiuscule obsita, trinervata nervis secundariis supra invisibilibus subtus planis et inconspicuis. Panicula multiflora ca. 30 X 16 cm; flores 5-meri breviter (3-7 mm) pedicellati, bracteolis 2 X 0.5-0.7 mm lanceato-oblongis ca. 2 mm infra hypanthii basim insertis mox caducis. Hypanthium (ad torum) 4.1-4.2 mm longum; calycis tubus 0.3-0.4 mm altus, lobis 1.2 mm longis triangularibus ad bases paulo remotis apice hebeti. Petala 7.5-8 X 5-6 mm ciliolata obovata apice asymmetricice rotundato. Stamina dimorphica glabra, filamentis 5 mm longis, thecis subulatis 0.6-0.7 mm crassis 5 vel 4 mm longis poro ventraliter inclinato, connectivis 2.5 vel 0.5 mm prolongatis appendicibus ventralibus 1.1-1.2 X 0.4-0.5 mm hebetibus. Stigma truncatum; stylus 7.5-8 X 5-6 mm ciliolata obovata apice asymmetricice rotundato. Stamina dimorphica glabra, filamentis 5 mm longis, thecis subulatis 0.6-0.7 mm crassis 5 vel 4 mm longis poro ventraliter inclinato, connectivis 2.5 vel 0.5 mm prolongatis appendicibus ventralibus 1.1-1.2 X 0.4-0.5 mm hebetibus. Stigma truncatum; stylus 7.5-8 X 0.3-0.6 mm glaber; ovarii apex dense setis paulo compressis erosulis 0.5-1 mm longis dense armatus.

Type Collection: G. L. Webster, Kim Miller, & Lillian Miller 12361 (holotype US 2530465), collected on the wooded slopes of Cordillera de Talamanca, 12 miles southeast of Cartago, Cartago, Costa Rica, elev. 1600 m, 15 July 1962. "Shrub 7 m; flowers pink."

The other three species in Sect. Lepidotae have dense lower leaf surface pubescence, few-flowered inflorescences, much larger flowers (calyx lobes 5-9 mm long, petals 15-30 mm long, anther thecae 7-9 mm long), and approximately isomorphic stamens. The discovery of an additional species of Tibouchina in this section of the genus, quite unexpected by me, again emphasizes the South American affinities of much of the Costa Rican flora; the relatives range in the Andes from Venezuela to central Peru.

The general aspect of T. inopinata, especially the large

inflorescences with relatively small flowers, is suggestive of Sect. Barbigerae, but the stamens lack the connective hair tuft characteristic of that species group. The only Central American member of Sect. Barbigerae, T. bipenicillata (Naud.) Cogn., occurs in Panama and Costa Rica and can be distinguished vegetatively from T. inopinata by the definitely 5-nerved leaves with non-squamate hairs on the lower surface; the Central American material of this species has denser lower leaf surface pubescence and is perhaps subspecifically distinct from the typical Colombia-Venezuela population. Costa Rican collections ascribed by Cogniaux to T. mathaei Cogn. are actually this variant of T. bipenicillata.

CONOSTEGIA INUSITATA Wurdack, sp. nov.

De congeneribus hypanthiis calyptrisque 4-alatis differt.

Frutex 1.5-2 m altus glaber vel primum minutissime sparseque furfuraceus mox glabratus; rami primum obscure quadrangulati demum teretes paulo infra nodos biperforati. Petioli 1.5-4 cm longi; lamina 15-30 X 7-13 cm membranacea obovato-oblonga vel elliptica apicem versus obscure undulato-serrulata dentibus ca. 5 mm inter se distantibus et 0.1-0.7 mm profundis apice per ca. 2 cm abrupte angustate acuminato basi anguste vel late acuta, breviter (1-2 cm) triplinervata (pare exteriore marginali debili neglecto) nervis secundariis 0.7-1 cm inter se distantibus venulis planis laxe reticulatis areolis irregularibus 1-3 mm latis. Paniculae terminales plerumque 5-11-florigerae ramis axequae quadrangulatis; pedicelli plerumque 14-17 mm longi, bracteolis mox caducis non visis ad hypanthii basim insertis. Hypanthium (ad torum) 10-12 mm longum 4-alatum, alis 0.4-0.7 mm altis; calyx calyptriformis longe acuminatus ca. 40 mm longus 4-alatus ad anthesim 2-3 mm supra torum dehiscens. Petala 4 intus apicem versus minutissime granulosa alioqui glabra 14-15 X 10-11 mm obovato-oblonga apice obtuso vel rotundato. Stamina numerosissima glabra; filamenta 4-7 mm longa; thecae 3.5-6 X 0.6 X 0.8-1 mm anguste lanceatae poro 0.2 mm diam. paulo ventraliter inclinato, connectivo simplici non prolongato. Stigma capitatum 3.5 mm diam.; stylus glaber; ovarium 10-loculare omnino inferum apice glabro.

Type Collection: P. C. Hutchison, J. K. Wright, & R. M. Straw 6057 (holotype US 2492341; isotypes UC, USM; 4 additional isotypes to be distributed), collected at lower Boquerón del Padre Abad, Prov. Coronel Portillo, Depto. Loreto, Peru, elev. 480 m, 25 July 1964. "Erect shrub 1.5-2 m on steep hillside. Largest leaves apical; leafless below. Flowers and buds strongly quadrangular. Petals white; filaments pink; anthers pale purple."

Paratype: Ramón Ferreyra 1173, from Boquerón, San Martín, Peru.

No other species of Conostegia has alate hypanthia and calyces (nor to my knowledge only 4 petals). In the one bud dissected, 96 stamens were counted, varying considerably in size but otherwise isomorphic; the stamens in number are the greatest

known to me in the Melastomataceae. The infranodal perforations are reminiscent of those found in Miconia flaccida Gleason, probably indicating myrmecophily. Killip & Smith 26184 (from Santa Rosa, Junín), cited in the Flora of Peru as doubtfully Meriania prunifolia D. Don, is surely an undescribed relative of C. inusitata; the fruiting Junín collection differs in the entire leaves and solitary flowers with multicostate (but not truly winged) hypanthia. When Conostegia is next revised, C. inusitata probably should be treated as infragenerically distinct from the other presently described species of the genus.

MICONIA LATERIFLORA Cogn. subsp. MONTICELLENSIS Wurdack, subsp. nov.

A subsp. typica dichasiorum floribus lateralibus 2-3 mm pedicellatis differt.

Type Collection: A. C. Smith 3571 (holotype US 1777379; isotype NY), collected on the northwestern slopes of the Kanuku Mountains in the drainage of Moku-moku Creek (Takutu tributary), British Guiana, elev. 150-400 m, 31 March-16 April 1938. "Shrub 3-4 m; petals and stamens white."

Paratypes: Venezuela: T. Lasser 1305 (NY), from Sta. Elena de Uairen, Edo. Bolívar. British Guiana: A. C. Smith 3665, from Mount Iramaikpang, Kanuku Mountains, elev. 650 m. Suriname: H. S. Irwin, G. T. Prance, T. R. Soderstrom, & Noel Holmgren 54492, 54648, 54788, 55091, all from the vicinity of Juliana Top, Wilhelmina Gebergte, elev. 275-800 m; B. W. 7220, from the Wilhelmina Gebergte.

In the wide-ranging typical element, the lateral flowers (as well as the terminal one) in each dichasium are sessile, the inflorescence nodes are minutely setulose with barbellate hairs ca. 0.2 mm long, and the leaf bases are acute to obtuse. In subsp. monticellensis, the inflorescence nodes are glabrous or very sparsely and caducously stellulate-furfuraceous and the leaf bases are obscurely cordate. In all material examined of the pedicellate-flowered subspecies, the ovaries were 3-celled; in the few suitable collections of the typical subspecies, the ovaries were 4-celled, but the limited sampling did not seem sufficient for conclusive use of this feature as a distinction. As previously noted in Mem. N. Y. Bot. Gard. 10(5): 168, the Amazon-Orinoco collections of the typical subspecies generally have much shorter external calyx teeth than those from Central America and Colombia, but a few Venezuelan collections (Steyermark 90086 from Miranda, Breteler 3842 from Delta Amacuro) somewhat bridge the dimensional gap in this feature.

Standley described a variant of M. lateriflora (Ossaea disparilis var. adenophora) as having the mature fruit glandular-setulose. Glandular-setulose fruits do occur in some South American material (Steyermark 87139 from Delta Amacuro and Steyermark 90086 from Miranda, Venezuela; Fanshawe 1983, British Guiana), but I have not yet seen any flowering or young fruiting material with hypanthia glandular-setulose nor have I found any collections with completely glabrous mature fruits; perhaps

these glandular-setulose hairs elongate rapidly on the completely mature fruit and are only obscure sessile glands in flower and young fruit. Miconia polita Gleason, from the Kaieteur Plateau, British Guiana, and adjacent Venezuela resembles M. lateriflora vegetatively (but with leaves somewhat firmer and marginally discolored when dry), but has larger 5-merous flowers; the pedicellate 5-merous fruits serve as a distinction from the "variant" of M. lateriflora with glandular-setulose mature berries.

MICONIA OBCONICA Gleason & Wurdack, sp. nov.

Sect. Octomeris. In systema Cogniauxii, M. atratae (Spring) Wawra et M. novemnerviae Naud. affinis, floribus pedicellatis differt.

Ramuli teretes sicut petioli laminarum venae primariae subtus inflorescentiaque pilis barbellatis debilibus demum caducis usque ad 0.5 mm longis modice induti. Petioli (0.5-)2-3 cm longi; lamina (6-)9-18 X (3.5-)5-10 cm ovata apice anguste acuto basi paulo (0.4-0.8 cm) cordata, rigidiuscula et ciliato-serrulata dentibus 1-2 mm inter se distantibus ciliis gracilibus 1-2 mm longis, supra modice laxaeque bullato-strigosa pilis gracilibus laevibus 1-2 mm longis basi ipsa conicis, subtus in nervulis superficieque modice setulosa pilis crispulis laevibus ornata, (5-)7-nervata nervis secundariis 3-5 mm inter se distantibus, venulis subtus laxe elevato-reticulatis areolis 1-2 mm latis. Panicula multiflora vel submultiflora 6-11 X 4.5-8 cm; flores 5-meri, pedicellis 1.5-2 mm longis, bracteolis ca. 0.7 mm longis subulatis ante anthesim delapsis. Hypanthium (ad torum) 3.7 mm longum sparse setulis ca. 0.2 mm longis paucibarbellatis obsitum; calycis tubus 0.3 mm altus, lobis interioribus 0.6 mm altis oblati ciliolatis, dentibus exterioribus 0.3-0.4 mm longis conicis non eminentibus. Petala 8-8.5 X 4.6-6 mm ut videtur glabra sed sub lente minutissime granulosa oblongo-ovata, apice rotundato. Stamina isomorphica glabra; filamenta 5.7-6 mm longa; antherarum thecae 5.3-5.6 X 1.1 mm curvato-subulatae minute (0.2 mm) uniporae, connectivo nec prolongato nec appendiculato dorsaliter basim versus paulo elevato. Stigma punctiforme 0.2 mm diam.; stylus glaber 11.5 X 0.4-0.25 mm; ovarium 5-loculare 1/2-2/3 inferum, apice truncato-conico 1.5 mm alto modice puberulo, pilis 0.1 mm longis gracilibus glanduliferis.

Type Collection: G. B. Hinton 10361 (holotype US 2089733), collected in oak and pine forest at Vallecitos, Montes de Oca, Guerrero, Mexico, elev. 500 m, 24 June 1937. "0.5 m high."

Paratype: G. E. Crisman & W. D. Willis 160 (MICH), from 1.2 km east of Agua de Obispo, Guerrero, elev. 950 m, 10 June 1954.

The Brazilian M. atrata (ex char.) has the flowers sessile, the hypanthia glandular-setose, the petals puberulous outside, and the ovary 3-celled; M. novemnervia of Venezuela (ex char. & Macbride photograph 25994) has the leaves stellate-tomentose beneath, the flowers sessile, and the petals only 6-7 mm long.

Certainly M. obconica has no immediate Central American relatives, spp. 69-71 of Cogniaux' monograph being quite different and with much smaller flowers. Miconia saxicola Brandegee (Gleason has so identified Rose 1932 from Tepic and I have followed him for recent collections from Sinaloa and Durango) has relatively broader leaves, inflorescence hairs in part gland-tipped, and slightly projecting external calyx teeth; as noted by Gleason, the general aspect of M. saxicola is suggestive of Clidemia or Heterotrichum (cf. C. matudae L. Wms.). Among the other Central American species of Miconia Sect. Octomeris, Gleason suggested that M. schlimii Triana was better placed in Sect. Amblyarrhena and M. melanotricha (Triana) Gleason in Sect. Chaenopleura; the anthers in the latter species are strongly suggestive of those in Charianthus. Two other Guerrero collections (MICH), Rhymes & Rowell 3856 (from 10 miles southeast of Colotlipa) and V. M. Hicks 3570 (from 8 miles southeast of Colotlipa), possibly are referable to M. obconica; both are rather inadequate specimens in young bud and the latter essentially lacks simple hairs on the lower leaf surfaces. For both M. obconica and M. heterothrix, Dr. Gleason had done dissection notes and drawings, so the joint attribution of the binomials is appropriate; the Hinton collections have been widely distributed under these names.

MICONIA HETEROTHRIX Gleason & Wurdack, sp. nov.

M. tepicanae Standl. affinis, foliis minoribus basim versus pilis simplicibus sparse indutis inflorescentiis hypanthiisque sparse vel modice glanduloso-setulosis differt.

Ramuli primum paulo quadrisulcati mox teretes sicut petioli modice stellulato-puberuli demum glabrati, sparse vel sparsissime et caduce setulosi (pilis sparse barbellatis gracilibus 0.3-1 mm longis) et interdum sparsissime caduceque glanduloso-setulosi. Petioli 1.5-2 cm longi; lamina 4.5-9(-11) X 3-5(-6) cm elliptico-ovata, apice breviter (0.3-1 cm) hebeti-acuminato vel acuto, basi paulo (0.2-0.4 cm) cordata vel late obtusa, firme membranacea et obscure distanterque undulato-serrulata (dentibus setuliferis), supra primum sparsissime strigulosa mox glabrata, subtus primum sparse setulosa (pilis simplicibus) et glandulis clavatis minutis modice ornatis, nervis primariis basim versus exceptis glabrata, 5(-7)-nervata nervis secundariis plerumque 4(-6) mm inter se distantibus, nervulis subtus planis laxiuscule reticulatis areolis ca. 1 mm latis. Panicula 6-12 (-15) cm longa submultiflora sicut hypanthia sparse stellulato-puberula et sparse vel modice glanduloso-setulosa; flores 5-meri, pedicellis 1.5-3(-5) mm longis, bracteolis lanceato-linearibus ca. 1 mm longis ante anthesim caducis vel subsistentibus. Hypanthium (ad torum) 2.8-3 mm longum; calycis tubus 0.1-0.2 mm altus, lobis interioribus 0.2-0.3 mm altis ovatis ad bases remotis, dentibus exterioribus obsoletis. Petala alba glabra 2.5 X 1.9-2 mm late obovata apice asymmetricè retuso. Stamina paulo dimorphica glabra; filamenta 2.8 vel 1.7 mm longa; antherarum thecae 2-2.1 X 0.7-0.8 X 0.5-0.6 mm oblongae uni-

porosae (poro 0.2 mm diam. paulo ventraliter inclinato) paulo vel distincte curvatae, connectivo ad basim ventraliter paulo (0.1-0.3 mm) prolongato truncato-retuso. Stigma punctiforme 0.1 mm diam.; stylus 4.5 X 0.25 mm centraliter plerumque glandulis paucis 0.1 mm longis ornatus in ovarii apicem 0.3 mm immersus; ovarium triloculare $\frac{1}{2}$ inferum apice pilis glanduliferis 0.1-0.2 mm longis 5-12 ornatum.

Type Collection: G. B. Hinton 9936 (holotype US 1979367), collected in pine forest at Laguna-Paracho, Mina, Guerrero, Mexico, 12 Jan. 1936.

Paratypes (all Mexico): G. B. Hinton 10752, from Pilas, Mina, Guerrero, elev. 1760 m; G. B. Hinton 12710, from Puerto Zarzamora, Coalcomán, Michoacán, elev. 1680 m; R. McVaugh 22776, from 15 km south of Asseradero Dos Aguas, Michoacán, elev. 1650-1700 m (fruiting).

Miconia tepicana has entire leaf blades 13-15 X 8-9 cm and densely stellate-puberulous beneath (a very few gland-tipped hairs basally along the main veins), the inflorescence and hypanthia moderately stellate-puberulous but without gland-tipped hairs, rotund-ovate calyx lobes 0.5 mm long, and glabrous ovary apices; in stamens, petals, and style, the two species are alike. The two Michoacán collections of M. heterothrix have somewhat thinner and pseudo-plinerved leaves (inner pair of primaries paralleling the costa for 0.3-0.6 cm above the blade base) than specimens from Guerrero. Other relatives in floral structure of M. heterothrix are M. madrensis Standl. and M. glabrata Cogn.; both species have entire leaf blades and eglandular inflorescence hairs, with the latter having smaller flowers than its allies. All four species share the features of setulose vein axils on the lower leaf surfaces, basally bent anthers, non-expanded stigmas, and sparsely glandular-puberulous styles; the arcuate anthers are not typical for Sect. Amblyarrhena. The foliar character combination of plinervation and setulose axils gives these species somewhat the vegetative aspect of M. mexicana (Bonpl.) Naud. and its immediate allies, but the floral features negate any suggestion of intimate relationship. Dr. McVaugh has twice collected (14239, 21324) in Jalisco plants which at first glance seem specifically different (attenuated stellulate pubescence, large thin leaves with caducously setulose petioles) from M. madrensis; however, I believe them probably to be only ecads, perhaps subspecifically separable when the Rose locality in Tepic yields further samples of the typical variation.

The general aspect of M. heterothrix is somewhat reminiscent of the species group around M. ravenii Wurdack (Phytologia 14: 270. 1967), but all these species have straight and rather elongate anthers. Incidentally I can find no reason for the separation of Clidemia glandulifera Cogn. (Bot. Gaz. 20: 289. 1895) from Miconia tuerckheimii Cogn. (Bot. Gaz. 16: 5. 1891); because of the relationship with M. ravenii, I prefer at present to treat the species in Miconia. Of course the epithet tuerckheimii is preempted in Clidemia by C. tuerckheimii (Donn. Sm.) Gleason.

MICONIA DIVISORIANA Wurdack, sp. nov.

M. centrodesmae Naud. affinis, foliis minoribus non plinervatis ramulis pilis stipitato-stellatis ornatis differt.

Ramuli teretiusculi sicut petioli foliorum subtus venae primariae basim versus pilis stipitato-stellatis (stipite 0.5-1.2 mm longo ramulis ca. 0.1 mm longis) densiuscule ornati et pilis stellulatis sessilibus sparse vel modice induti. Petioli 0.6-1.2 cm longi; lamina 5-11 X 2-4 cm anguste elliptica, apice anguste acuto, basi late acuta vel obtusa, fragilis et integra, pilis appressis 0.7-1 mm longis simplicibus laevibus densiuscule ciliolata, supra primum pilis stellulatis et stipitato-stellatis sparse ornata nervis primariis exceptis mox glabrata, subtus in venulis superficieque glabra, trinervata (pare inframarginali tenui neglecto) nervis secundariis 0.5-0.7 cm inter se distantibus supra insculptis subtus creberrime elevatis nervulis planis laxe reticulatis areolis irregularibus 1-2 mm latis. Panicula submultiflora axe arcte refracto modice stellulato-puberulo et basim versus sparse pilis stipitato-stellatis ornato; flores 4-meri breviter (0.5-1.5 mm) pedicellati, bracteolis setuliformibus ca. 0.7-0.9 mm longis ca. 0.1-0.3 mm infra hypanthii basim insertis. Hypanthium (ad torum) 1.5 mm longum sparse stellulato-puberulum et apicem versus sparsissime setulosum; calyx hyalinus ca. 0.5 mm altus in alabastris clausus ad anthesim dehiscens, dentibus exterioribus setuliformibus ca. 0.3 mm longis; torus intus dense puberulus pilis clavatis 0.05 mm longis. Petala glabra 2 X 0.9 mm lanceata apice hebeti-acuto. Stamina isomorphica glabra; filamenta 1 mm longa; antherarum thecae 1 X 0.4 X 0.4 mm, apice minute (0.1 mm) uniporoso, connectivo non prolongato ventraliter exappendiculato dorsaliter dente hebeti 0.4 mm longo descendente ornato. Stigma punctiforme; stylus 3 X 0.25-0.1 mm glaber in ovarii apicem paulo immersus; ovarium 4-loculare 2/3 inferum, apice 8-angulato conico in angulis sparsissime setuloso setulis 0.05 mm longis.

Type Collection: Ramón Ferreyra 1669 (holotype US 2100724; isotype USM), collected in tropical forest at Divisoria, Prov. Coronel Portillo, Depto. Loreto, Peru, elev. 1500-1600 m, 28 Feb. 1947. "Arbusto 1.5-2 m. Flores amarillentas."

Paratype: E. Woytkowski 34516 (UC), from Divisoria, Huánuco, Peru, elev. 1500-1600 m, 12 Sept. 1946. "Plant 1.6 m tall; leaf top glossy, underneath pale green. Flowers cream-yellow; calyx green; stalk dark purple."

While the petal shape of M. divisoriana perhaps would superficially indicate a relationship to Leandra, the obvious similarity in inflorescence bracteoles, stamens, and pistil are sufficient phylogenetic reminders of M. centrodesma; this presumptive relative lacks stipitate-stellate pubescence and has much larger plinerved leaves. Certainly there are no obvious Andean relatives of M. divisoriana in either Leandra or Ossaea. Judging from the similarities, Clidemia trichopoda Gleason should also be placed in the M. centrodesma alliance, but I have not yet seen flowering material of that Costa Rican species; a recent collection, fruiting as were the specimens available to Gleason,

is Schnell 644 from Valle Escondido, Cartago.

MICONIA MAROANA Wurdack, sp. nov.

Sect. Miconia, Subsect. Glomeratiflorae. M. martinianae Gleason affinis, foliis 3(-5)-nervatis ad basim acutis differt.

Ramuli paulo compressi demum teretes sicut folia subtus inflorescentia hypanthiaque pilis pinoideis 0.2-0.5 mm longis ravis vel brunneis omnino velati. Petioli 2-3 cm longi; lamina 14-20 X 5-9 cm oblongo-elliptica vel elliptica, apice hebeti-acuto vel breviter subabrupteque per 1-1.5 cm acuminato, basi late acuta, crassiuscula et integra, supra glabra, trinervata (pare exteriore marginali neglecto) nervis secundariis 0.6-0.8 cm inter se distantibus supra crebre impressis subtus prominenter elevatis nervulis subtus subdense reticulatis areolis ca. 0.4 mm latis ob pilos plerumque occultis. Panicula subspiciformis 8-11 cm longa, ramis brevissimis oppositis crassis 0.3-0.7 cm longis; flores 5-meri ad ramorum apices multiglomerati sessiles, bracteolis 2-2.5 X 1 mm persistentibus. Hypanthium (ad torum) 2.5 mm longum intus sparse gracili-strigulosum; calycis tubus 0.9-1 mm altus intus densiuscule puberulus, lobis interioribus 0.5 mm altis rotundatis intus sparsiuscule puberulis, dentibus exterioribus hebeti-subulatis ca. 0.3 mm eminentibus. Petala minutissime granulosa 2.4-2.5 X 1.5 mm oblongo-ovovata apice paulo retuso. Stamina glabra in forma isomorphica in dimensionibus paulo anisomorphica; filamenta 3.5 vel 3 mm longa; antherarum thecae 4.4-4.6 vel 3.1-3.3 mm subulatae minute uniporosa, poro ventraliter inclinato, connectivo non prolongato ventraliter bilobato et interdum glandulis paucis ornato. Stigma truncatum non expansum; stylus 5 X 0.3 mm basim versus sparse granulosis in ovarii apicem 0.3 mm immersus; ovarium 3-loculare ad basim ipsam ovuliferum 4/5 superum dense strigulosum pilis barbellatis gracilibus.

Type Collection: Llewelyn Williams 14431 (holotype US 1878445; isotype VEN), collected in clearings at Maroa, Río Guainía, Terr. Amazonas, Venezuela, elev. 127 m, 19 Feb. 1942. "Arbusto 2 m alto, tendido; flores blancas con filamentos amarillos."

The suggested relative, known only from Peru (San Martín) has 5-plinerved leaves with cordulate bases, petals externally stellate-pubescent, longer styles, and capitellate stigmas. The nearly free oblong densely pubescent ovaries and non-expanded stigmas serve as distinctions from both M. phanerostila Pilger (with plinerved leaves) and M. compacta Gleason (with thinner basally rounded leaves, less dense pubescence on the lower leaf surfaces, and glandular filaments).

MICONIA MULTISPICATA Naud.

M. perplexans Sprague, Trans. Proc. Bot. Soc. Edinb. 22: 432. 1905.

No differences are apparent between Jamaican collections of this species (Proctor 11750, Maxon 2793, Harris 6333, Harris & Britton 10540) and those from northwestern Venezuela (Yaracuy:

H. M. Curran 36. Barinas: Barinitas, Bernardi 3290. Zulua: southwest of Machiques, Steyermark 99939) and eastern Colombia (Meta: Idrobo & Schultes 596, 1221; Philipson, Idrobo, & Fernandez 1395; Sprague 31, type no. of M. perplexans, K. Norte de Santander: Cuatrecasas 13222, with leaves obscurely denticulate. Magdalena: Romero Castañeda 822, with large undulately denticulate leaves. Casanare: Uribe 3901. Caquetá: Perez Arbelaez 657. Vaupés: Cuatrecasas 7635). Miconia ruficalyx Gleason is very closely allied to M. multispicata, but is distinguishable by the finer reddish pubescence, linear-subulate (1.5 X 0.2-0.3 mm) and very early caducous rather than elliptic (2.5-4 X 1-3 mm) and subsistent flower bracteoles, and slightly different large anthers. Gleason's citation of a 4-celled ovary for M. ruficalyx does not represent the usual condition, my own dissections on various collections (including an isotype) indicating predominantly 3-celled ovaries. Miconia ruficalyx ranges from Trinidad (there including the material cited by Cogniaux and Gleason as M. multispicata) and eastern Venezuela to Brazil (Amapá); one apparent distributional anomaly is represented by Cuatrecasas 16745 (NY), from El Valle, Colombia, fruiting only, which agrees with Trinidad-Guiana collections in all obvious features. As suggested by Gleason, both M. ruficalyx and M. multispicata (especially the latter) are closely related to M. eriodonta DC. (synonym: M. membranica Gleason) which has generally larger leaves and inflorescence bracts. Miconia eriodonta has rather coarse pubescence as in M. multispicata but larger anthers and generally longer inflorescence branches.

MICONIA AMISSA Wurdack, nom. nov.

Graffenrieda stellipilis Gleason, Am. Jour. Bot. 19: 742. 1932, non Miconia stellipilis Cogn., Bull. N. Y. Bot. Gard. 4: 360. 1907.

Gleason's description of G. stellipilis was based on materials in young bud and young fruit (both of which show inferior ovaries). However, Bang 492 (distributed as M. eriodonta), identical with Buchtien 7407 and 7408 except for slightly larger stellate hairs on the lower leaf surfaces, shows mature floral characters as follows: flowers 5-6-merous; hypanthium (to the torus) 1.7 X 3 mm; calyx 2.3 mm, with truncate or slightly undulate margins; petals narrowly obovate, 5 X 2.7-3 mm; stamens slightly dimorphic, glabrous; filaments 5 or 3.5-3.8 mm; thecae 2.4 or 1.8 mm, the connective prolonged 0.2 mm to the filament insertion and with a blunt dorsal appendage 0.3 or 0.2 mm long; stigma truncate, 0.6 mm diam.; style glabrous, 6 mm long; ovary essentially completely inferior, 3-4-celled. Another collection in young bud, Rusby 2726, is the same as Bang 492 and was the basis of Britton's and Cogniaux' erroneous reports (Bull. Torrey Club 17: 93. 1890; DC. Mon. Phan. 7: 793. 1891) of M. eriodonta in Bolivia. The closest relatives of M. amissa are not obvious. The general floral aspect is reminiscent of that in M. versicolor Naud., M. kraenzlinii Cogn., and M. archeri Wurdack, but the floral details are not consistent with any

intimate affinity with these Colombian species. In Cogniaux' monographic arrangement, M. amissa would perhaps best be placed near M. molybdea Naud., which differs in the very dense persistent tomentum on the lower leaf surfaces, definitely lobed calyx, and glandular bases of the stamen connectives.

MICONIA WOYTKOWSKII Wurdack, sp. nov.

M. matthaei Naud. affinis, foliis tenuioribus distincte undulato-denticulatis supra pilosis differt.

Ramuli sulcati sicut petioli laminarum costa supra et subtus inflorescentiaque modice setosi, pilis gracilibus rufidulis 4-6 mm longis laevibus ad nodos densissime aggregatis. Petioli 1-2 cm longi; lamina (10-)15-23 X 4.5-11 cm oblongo-elliptica, apice subabrupte per 1-1.5 cm acuminato, basi obtusa vel rotundata, membranacea et distincte undulato-serrulata dentibus ca. 5 mm inter se distantibus et 1-2 mm profundis, supra et subtus sparsiuscule gracili-setosa, trinervata, venis secundariis 0.5-0.7 cm inter se distantibus nervulis supra obscuris subtus planis et densiuscule reticulatis areolis 0.2-0.3 mm latis. Panicula multiflora 15 cm longa; flores 5-meri sessiles in glomerulis interruptis vel ad ramulorum apices aggregati, bracteolis 2 X 0.2-0.3 mm linearibus usque ad anthesim persistentibus. Hypanthium (ad torum) 2.3 mm longum sparse stellulato-puberulum; calycis tubus 0.2 mm altus, lobis interioribus oblongis 0.6 mm longis extus sparse gracili-setosis, dentibus exterioribus brevibus non eminentibus gracili-setosis. Petala imperspicue granulosa 3.8-4 X 1.5-1.8 mm obovato-oblonga, apice plerumque paulo retuso. Stamina paulo dimorphica glabra; filamenta 4.5-5 vel 3.5-3.7 mm longa; antherarum thecae 2.3-2.5 X 0.4 vel 2.1 X 0.3 mm paulo subulatae, poro minuto ventraliter inclinato, connectivo vix (0.1 mm) prolongato ventraliter ad basim bilobulato lobulis utrisque glandulis sessilibus 1-3 ornatis. Stigma expansum 0.8 mm diam.; stylus 8 X 0.3-0.4 mm glaber in ovarii collo 0.4 mm immersus; ovarium 3-loculare $\frac{1}{2}$ inferum, apice conico lobulato (lobulis 0.1-0.15 mm altis) et inconspicue setuloso setulis 0.1 mm longis.

Type Collection: F. Woytkowski 34407 (holotype UC 1013846; isotype UC), collected in a forest opening at Boqueron Padre Abad, Depto. Loreto, Peru, elev. 260 m, 21 Aug. 1946. "Shrub 3 m; stalk covered with brown curly hair; flowers white; calyx green."

Miconia matthaei has firm-membranaceous to subcoriaceous leaves which are essentially entire and glabrous above, but anthers and pistil similar to those of M. woytkowskii; incidentally Cogniaux' petal dimensions (8 mm long) for M. matthaei (copied also in the Flora of Peru) are surely erroneous, the corolla actually being 3-3.5 mm long. The other species bracketed in this relationship by Cogniaux, M. heteromera Naud., differs (ex char. and photograph) at least in the much smaller leaves, shorter pubescence, and few pedicellate flowers with subtruncate calyx limb. While M. woytkowskii is somewhat suggestive in general aspect of M. ericoclada Triana, that species

has shorter pale pubescence and quite different and smaller stamens; *M. erioclada* has recently been collected in Colombia (Río San Miguel, Putumayo, Cuatrecasas 11049).

MICONIA MCVAUGHII Wurdack, sp. nov.

Sect. Amblyarrhena. De affinitate proxima mihi incognita, sed ob hypanthia 5-alata bene distincta.

Ramuli teretes primum sparse setosi (pilis gracilibus laevibus 1-2 mm longis) mox glabrati. Petioli 1-2(-3.5) cm longi sparse breviterque setosi; lamina 6-12 X 2-4 cm lanceata, apice gradatim acuminato, basi late acuta, membranacea et obscure distanterque undulato-serrulata sparse ciliolata, supra margines versus sparsissima strigulosa, subtus in nervorum primariorum axillis modice setulosa alioqui glabra, 5-plinervata pare exteriore tenui pare interiore 0.7-1 cm supra basim subalternatim divergente nervis secundariis ca. 3 mm inter se distantibus supra obscuris subtus planis, nervulis subtus planis laxe reticulatis. Panicula pauciflora 5-6 cm longa glabra; flores 5-meri glabri, pedicellis 5-alatis 3 mm longis apicem versus expansis. Hypanthium (ad torum) 3.5 mm longum 5-alatum alis 0.7-1 mm altis; calycis tubus 1.2-1.3 mm longus, lobis interioribus 0.7 mm altis ovatis, dentibus exterioribus prominenter eminentibus ca. 3 mm longis acutis carinatis. Petala glabra 6-6.5 X 3.5-3.8 mm elliptico-oblonga apice truncato-rotundato. Stamina isomorphica glabra; filamenta 5 mm longa ca. 0.4 mm supra antherarum bases dorsaliter inserta; thecae 3.5-3.7 X 0.9-1 X 1.3-1.5 mm rectae anguste oblongae, poro apicali 0.15-0.2 mm diam., connectivo simplici dorsaliter basim versus per 1.3-1.5 mm paulo elevato. Stigma 0.3 mm diam. non expansum; stylus 9.5 X 0.6 mm glaber; ovarium 3-loculare $\frac{1}{4}$ inferum apice rotundato collo nullo. Semina pyramidata angulata laevia 0.7 X 0.4-0.5 mm.

Type Collection: Rogers McVaugh 13978 (holotype MICH; isotype US), collected in pine forest south and west of the divide between Aserradero San Miguel Una and Durazno, west-facing slopes of Sierra de Manantlán, 24-32 km southeast of Autlán, Jalisco, Mexico, elev. 1700 m, 22-23 March 1965. "Shrub 1-2 m, occasional; flowers white."

Paratype: Rogers McVaugh 23209, from seaward-facing slopes of Sierra de Manantlán, Jalisco, elev. 1500-1900 m, 22-23 March 1965. "Shrub 1-1.5 m, abundant; fruit strongly wing-angled."

The combination of winged pedicels and hypanthia, nearly superior 3-celled ovary, and punctiform stigma seems unprecedented. The hypanthial wings might suggest affinity with *M. bailloniana* Macbride, but that Peruvian species has the alae alternate with the sepals as well as apically glandular filaments and a 5-celled ovary. Although *M. incurva* Gleason and *M. schlimii* Triana have the same general anther form, both species have stellulate pubescence, terete hypanthia, expanded stigmas, and completely inferior 5-celled ovaries; *M. lundelliana* L. Wms. seems equally remote in vegetative and floral features. Several formicarial species of *Tococa*, all South American, have winged hypanthia, but are otherwise quite different from

M. mcvaughii.

MICONIA MILITIS Wurdack, sp. nov.

Sect. Amblyarrhena. M. pseudocentrophorae Cogn. affinis, foliis trinervatis indistincte denticulatis pedicellis longioribus differt.

Frutex vel arbor parva 3-5 m alta. Ramuli teretes sicut petioli foliorum subtus venae primariae inflorescentiaque pilis pinoideo-stellulatis 0.1-0.2(-0.3) mm longis modice vel dense induti. Petioli 1-2(-3) cm longi; lamina 4-8(-10) X 2-4 cm elliptica vel oblongo-elliptica, apice acuto vel paulo hebeti-acuminato, basi acuta vel anguste obtusa, chartacea et indistincte serrulata dentibus 0.1-0.2 mm profundis et 1-2 mm inter se distantibus ciliis conicis 0.1-0.2 mm longis, supra plana centraliter glabra margines versus sparse vel sparsissime strigulosa setulis conicis crassis 0.2-0.3 mm longis, in costa basim versus sparse setulosa pilis usque ad 0.5 mm longis barbellatis demum caducis, subtus in venis secundariis primum sparse stellulato-puberula demum glabrata in superficie glabra, trinervata (pare inframarginali tenuissimi neglecto) nervis secundariis 2-3 mm inter se distantibus venulis subtus planis densiuscule anastomosantibus areolis 0.3-0.5 mm latis. Panicula submultiflora 3-5 cm longa, ramulis pilis obscure barbellatis erectis usque ad 1 mm longis sparse indutis; flores 5-meri in glomerulis 3-8-floris umbellatim dispositi, pedicellis 1.5-2 mm longis, bracteolis inconspicuis 0.5-0.7 mm longis lanceatis persistentibus ad pedicellorum bases insertis. Hypanthium (ad torum) 2.3-2.4 mm longum sparse vel modice stellulato-puberulum; calycis tubus 0.2-0.3 mm altus, lobis interioribus 0.1-0.15 mm altis, dentibus exterioribus conicis lobos interiores aequantibus. Petala alba dense minutissimeque granulosa 1.6-1.8 X 1.7-1.8 mm suborbicularia apice paulo emarginato. Stamina isomorphica glabra; filamenta 2.3-2.5 mm longa; antherarum thecae 1.6-1.8 X 0.6 X 0.6 mm oblongae poro 0.2 mm diam., connectivo non prolongato dorsaliter ad basim dente hebeti descendente 0.1-0.15 mm longo ornato. Stigma expansum 0.6 mm diam.; stylus 4.5 X 0.4 mm glaber in ovarii apice 0.3-0.4 mm immersus; ovarium (3-)4-loculare 3/4 inferum apice glabro.

Type Collection: Rzedowski & McVaugh 160 (holotype MICH), collected in mesophytic forest 2 km northeast of Campamento El Gallo, granitic southwest slopes of Cerro Teotepec, 17°28' N, 100°13' W, Guerrero, Mexico, elev. 2650 m, 27-29 Jan. 1965.

Paratypes (all from Guerrero, flowering unless otherwise noted): Rzedowski 16479 (MICH, US), from Aserradero Agua Fria near Tlacotepec, elev. 2600 m, 10 April 1963; Rzedowski 16412 (MICH, US), from 5 km west of Camotla, Mun. Chichihualco de Leonardo Bravo, elev. 2600 m, 8 April 1963; Feddema 2790 (MICH, US), from 10 km. west of Camotla, Mun. Chichihualco about 40 km west of Chilpancingo, elev. 2500 m, 1 Dec. 1963; E. W. Nelson 7052 (US), from Omilteme (near Chilpancingo, fide Goldman), elev. 2200 m, 25 May 1903 (fruiting).

The Ecuadorian M. pseudocentrophora has distinctly 5-nerved

subrigid leaves with marginal teeth 1 mm apart and 0.3 mm deep, as well as pedicels at anthesis averaging about 1 mm long and elongate-pinoid hairs ca. 0.5 mm long along the primary veins on the lower leaf surfaces (rather than pinoid-stellulate hairs 0.1-0.2 mm long); both species are remarkably alike in floral details, especially in the glabrous ovaries. Two other Peruvian relatives, *M. centrophora* Naud. and *M. chrysanthera* Cogn. have setulose ovary apices; Gleason's notes on the Berlin type of the latter species indicated a glabrous ovary, but recent topotypical material (Hutchison & Wright 5064) and other Cajamarca collections all have setulose ovaries. The geographic gap in the distribution of such a closely knit species-group is rather disconcerting. Several of the collections of *M. militis* had first been referred to *Leandra* because of the general vegetative resemblance to the *L. subseriata* (Naud.) Cogn.-*L. melanodesma* (Naud.) Cogn. group; however those species have acute petals (pointed buds) and a basically different inflorescence, the sessile flowers being subsecund on the short ultimate branches (rather than umbellulate or verticillate).

MICONIA TACANENSIS Wurdack, sp. nov.

Sect. *Amblyarrhena*. *M. amabili* Cogn. affinis, foliis angustioribus differt.

Ramuli argute quadrangulati sicut petioli laminarum venae primariae subtus inflorescentiaque pilis pinoideis 0.1-0.2 (-0.3) mm longis demum caducis densiuscule induti. Petioli 1.5-3.5 cm longi; lamina 7.5-15.5 X 3-5.5 cm elliptica vel oblongo-elliptica, apice hebeti-acuto, basi late acuta vel obtusa, integra et subcoriacea, ubique in superficie primum sparse stellulato-puberula mox glabrata, trinervata (pare exteriore tenuissimi neglecto) nervis secundariis 3-5(-7) mm inter se distantibus venulis subtus planis laxe reticulatis areolis ca. 1-1.5 mm latis. Panicula 9-12 cm longa multiflora; flores 5-meri, pedicellis crassis ca. 1 mm longis, bracteolis mox caducis non visis. Hypanthium (ad torum) 2.5 mm longum sparse stellulato-puberulum; calycis tubus 0.5 mm altus, lobis interioribus 0.4-0.5 mm altis oblongis rotundatis ciliolatis, dentibus exterioribus inconspicuis appressis non eminentibus. Petala 2.3 X 2.3-2.4 mm suborbicularia intus densiuscule granulosa. Stamina isomorphica; filamenta 2.5-2.7 mm longa sparse glanduloso-puberula pilis 0.1 mm longis; antherarum thecae 2-2.1 X 0.6 X 0.7 mm oblongae, poro 0.25-0.3 mm lato septo non emergente, connectivo non prolongato exappendiculato dorsaliter basim versus paulo elevato. Stigma peltatum 1.3 mm diam.; stylus (paulo immaturus) 3 X 0.6 mm sparse glanduloso-puberulus in ovarii apice 0.8 mm immersus; ovarium 3-loculare 1/3 inferum, apice 1.5 mm alto (collo incluso) truncato-conico pilis paucis glanduliferis 0.1 mm longis ornato.

Type Collection: *E. Matuda* 2939 (holotype MICH; isotypes MICH, US), collected west of Volcán Tacana, Chiapas, Mexico, elev. 2800 m, 30 March 1939. "Arbol 8-10 m, diam. 30-35 cm."

The suggested Bolivian relative has leaves 20 X 11-12 cm

and branchlets obtusely sulcate-quadrangular; other relatives include those South American species discussed in the description of M. saltuensis Wurdack (Phytologia 14: 272-273. 1967). In Cogniaux' monograph, M. tacanensis would probably key to the elusive M. denticulata Naud., which has (ex descr. and Macbride photograph) similar sharply quadrangular branchlets but apically denticulate leaf blades, smaller flowers (hypanthium plus calyx tube 2 mm long, petals 1 mm long), and punctiform stigmas. Among the Central American species of Miconia, M. tonduzii Cogn., M. hemenostigma Naud., and M. alpestris Cogn. have somewhat the general aspect of M. tacanensis, but all have broadly bipored anthers (Sect. Cremanium).

MICONIA LUCIDA Naudin subsp. PARIENSIS Wurdack, subsp. nov.

Foliorum venulis subtus planis floribus paulo minoribus differt.

Type Collection: J. A. Steyermark 94915 (holotype US 73534; isotype VEN), collected in cloud forest on top of Cerro de Humo, Peninsula de Parí, Edo. Sucre, Venezuela, elev. 1273 m, 2 March 1966. "Tree 3 m; leaves subcoriaceous, deep green above, paler rich green below with rose-red midrib and petiole or suffused magenta below; rachis rose-red; pedicels and calyx pale green suffused carmine; petals spreading, white with carmine-rose; filaments rose-magenta. Vern. name: rayillo."

Paratypes (both Peninsula de Parí, Sucre): J. A. Steyermark & M. Rabe 96341, from north-facing slopes of Cerro de Humo, elev. 700-800 m; J. A. Steyermark & M. Rabe 96385, from north-facing slopes of Cerro de Río Arriba, elev. 700 m.

The Cerro de Río Arriba paratype has somewhat larger leaves than the other two collections, conforming in this respect to the typical subspecies. Through the courtesy of the Museum d'Histoire Naturelle in Paris, I have been able to examine the holotype (Linden 307, from the Andes of Trujillo and Merida) of M. lucida subsp. lucida, still the only known collection; this Andean material has the secondary veins and venules of the leaves on the lower surface finely elevated-reticulate, as well as flowers about 1/3 larger than those of the eastern subspecies (hypanthium plus calyx 3.3-3.4 mm long rather than 3 mm; petals 5.3-5.5 mm long rather than 4.5-5 mm; anthers 2.3-2.4 mm long rather than 1.8 mm). Miconia roraimensis Ule is closely related to M. lucida, but has a definitely lobed calyx and smaller petals. An Andean relative of M. lucida is M. nitidissima Cogn., with basally rounded leaves, larger flowers, and lobed calyx limb; Dr. Gleason had indicated in his melastome notebook that M. nitidissima was misplaced in Sect. Tamonea, having anthers as in Sect. Amblyarrhena. Miconia lucida vegetatively is quite like M. curvipetiolata Cogn. & Gleason ex Gleason; that Colombian species, however, has subulate anthers like those of its near relatives in Sect. Tamonea (spp. 40-44 of Cogniaux' monograph) and indeed the mysterious M. foliosa Triana may well be an earlier name for it. I have not encountered, at least in the melastomes, any geographic range similar to that of the two

subspecies of M. lucida. I would expect at least some geographically intermediate collections from the coastal cordillera near Caracas.

ADDITIONAL NOTES ON THE GENUS VERBENA. VII

Harold N. Moldenke

VERBENA [Dorst.] L.

Additional bibliography: Robin, Fl. Louis. 385. 1807; Raf., Fl. Ludovic., pr. 1, 39, 128, 139, & 155. 1817; H. Becker, Über Keimung Verschied. Früchte [thesis] 1—129. 1912; Wolden, Proc. Iowa Acad. Sci. 39: 122—123. 1934; G. E. Nichols, Ecology 15: 265. 1934; Goss, Calif. Dept. Agr. Bull. 26: 326—333. 1937; Anon., Seed Trade Buyers Guide 1937: 150—151. 1937; J. N. Martin, Proc. Iowa Acad. Sci. 50: 222, 224, & 227. 1943; F. M. & E. T. Turrell, Proc. Iowa Acad. Sci. 50: 185. 1943; Covas & Hunziker, Rev. Invest. Agr. Buenos Aires 8: 251—253. 1954; L. J. Bradley, Ferns & Flow. Pl. Audubon Cent. 67. 1955; Cave, Ind. Pl. Chromosome Numb. 1: i & 46 (1958), 1: Suppl. vii & 50 (1959), and 1: 48. 1960; Rahn, Bot. Tidssk. 56: 122. 1960; Solbrig, Madroño 15: 220. 1960; Cave, Ind. Pl. Chromosome Numb. 2: 63 & 136—137. 1961; Hellyer, Amat. Gard. Photo Album 184. 1961; M. A. Rau, Bull. Bot. Surv. India 3: 238. 1961; Deb, Bull. Bot. Surv. India 3: 315. 1961; Solbrig, Madroño 16: 267. 1962; Heit, Assoc. Offic. Seed Analysts Newsletter 37 (2): 17. 1963; Cave, Ind. Pl. Chromosome Numb. 2: 331. 1964; Almquist, Fl. Upsal. 213. 1965; Batten & Bokelmann, Wild Fls. East. Cape Prov. 125 & pl. 99 (9). 1966; Anon., Biol. Abstr. 48 (22): S.188. 1967; Raf., Fl. Ludovic., pr. 2, 39, 128, 139, & 155. 1967; L. V. Barton, Bibl. Seeds 313 & 813. 1967; Twisselmann, Wasmann Journ. Biol. 25: 327. 1967; Fulling, Ind. Bot. Record. Bot. Review 563. 1967; Moldenke, Phytologia 16: 87—106. 1968; Breck, Better Gardens 18. 1968.

Although the Wolden (1934) reference in the bibliography above is dated "1932", according to the late Dr. J. H. Barnhart the actual date of publication was probably 1934.

VERBENA ABRAMSI Moldenke

Additional bibliography: Twisselmann, Wasmann Journ. Biol. 25: 327. 1967; Moldenke, Phytologia 15: 484 (1968) and 16: 96. 1968.

Twisselmann (1967) states that this species is common in Douglas oak woodland in the Greenhorn Range, but rare in vernal poolbeds in northern Temblor Range in Kern County, California. He gives "V. lasiostachys in part" as a synonym.

VERBENA AMBROSIFOLIA f. EGLANDULOSA Perry

Additional bibliography: Moldenke, Phytologia 15: 484—486. 1968.

Additional citations: MEXICO: Chihuahua: Moldenke & Moldenke 2095 (Z--photo).

VERBENA BANGIANA Moldenke

Additional bibliography: Moldenke, *Phytologia* 15: 485--486 (1968) and 16: 98. 1968.

VERBENA BIPINNATIFIDA Nutt.

Additional bibliography: Cave, *Ind. Pl. Chromosome Numb.* 2: 136. 1961; Solbrig, *Madroño* 16: 267. 1962; Cave, *Ind. Pl. Chromosome Numb.* 2: 216. 1963; Moldenke, *Phytologia* 16: 87. 1968.

Cave (1961, 1963) reports the haploid number of chromosomes for this species as 15.

Additional citations: ARIZONA: Cochise Co.: Moldenke & Moldenke 2052 (Z--photo).

VERBENA BONARIENSIS L.

Additional bibliography: Bonstedt, *Pareys Blumengärtn.*, ed. 1, 2: 273. 1932; Maatsch in Encke, *Pareys Blumengärtn.*, ed. 2, 2: 439--441. 1960; Hellyer, *Amat. Gard. Photo Album* 184. 1961; Rickett, *Wild Fls. U. S. 2* (2): 462, 463, & 685, pl. 170. 1967; Moldenke, *Phytologia* 15: 486--488 (1968) and 16: 98. 1968.

Additional illustrations: Hellyer, *Amat. Gard. Photo Album* 184. 1961; Rickett, *Wild Fls. U. S. 2* (2): pl. 170 [in color]. 1967.

Bonstedt (1932) lists *Verbena capensis* Thunb. as a synonymy of *V. bonariensis*, but it actually belongs in the synonymy of *Lippia javanica* (Burm. f.) Spreng. He records the German popular name, "bonarisches Eisenkraut", for *V. bonariensis*. The *V. bonariensis* var. *gracilis* Cham. which he lists is actually *V. intermedia* Gill. & Hook., as are also the *V. tenuis* Steud. and *V. chamissonis* Walp. which he includes as synonyms.

Maatsch (1960) states that *V. bonariensis* was introduced into cultivation in 1737 and gives the following cultural directions: "Verwendung dieser Art als einjährige Sommerblume in grösseren Gärten und Anlagen in bunten Pflanzungen oder auch auf Staudenrabatten als Lückenfüller. Anzucht durch Aussaat unter Glas im März, Vorkultur pikiert oder in kleinen Torftöpfen, im Mai im Kasten abhärten und aufpflanzen. Aussaat im Kasten im April ist auch möglich, verzögert aber den Beginn der Blüte."

Hellyer (1961) notes that in gardens this species is short-lived, but re-sows itself abundantly.

VERBENA BRACTEATA Lag. & Rodr.

Additional bibliography: Wolden, *Proc. Iowa Acad. Sci.* 39: 122--123. 1934; Solbrig, *Madroño* 15: 50 (1959) and 15: 220. 1960; Cave, *Ind. Pl. Chromosome Numb.* 1: 48 (1960) and 2: 63 & 79. 1961; Almqvist, *Fl. Upsal.* 213. 1965; Twisselmann, *Wasmann Journ. Biol.* 25: 327. 1967; Moldenke, *Phytologia* 16: 87. 1968.

Cave (1960) reports the haploid number of chromosomes in this species as 7 and 14. Wolden (1934) notes that "specimens collected on river bank at Estherville [Emmet County, Iowa] resemble

V. officinalis somewhat, but are probably hybrids between V. urticaefolia and V. bracteosa." This reference appears to be dated "1932", but the late Dr. J. H. Barnhart concluded after some research that it was not actually published until 1934.

Twisselmann (1967) tells us that V. bracteata is "common in wet soil on dessicating flats and in vernal poolbeds in [the] valley [of Kern County, California] and in Temblar Range, occasional around Lake Isabella, abundant in wet soil and shallow water of Kern National Wildlife Refuge."

VERBENA BRASILIENSIS Vell.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 136. 1961; Moldenke, Phytologia 16: 87 & 98. 1968.

Cave (1961) reports the haploid number of chromosomes in this species as 14 and the diploid number as 28.

VERBENA CALLIANTHA Briq.

Additional bibliography: Moldenke, Phytologia 15: 491. 1968.

Krapovickas thinks that this taxon is a natural hybrid between Verbena incisa Hook. and V. tenuisecta Briq. on the basis of his collection number 13085 which he regards as a hybrid between his no. 13087 (which he identified as Glandularia peruviana) and his no. 13080. This interspecific hybrid has hitherto been regarded by me as xV. trinitensis Moldenke. More study is required here.

Additional citations: ARGENTINA: Formosa: Krapovickas 13085 (Rf).

VERBENA CAMERONENSIS L. I. Davis

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, Phytologia 15: 491. 1968.

Cave (1961) reports the haploid chromosome number for this species as 15.

VERBENA CANADENSIS (L.) Britton

Additional bibliography: Raf., Fl. Ludovic., pr. 1, 139. 1817; Solbrig, Madroño 15: 51. 1959; Cave, Ind. Pl. Chromosome Numb. 1: 48 (1960) and 2: 331. 1964; Raf., Fl. Ludovic., pr. 2, 139. 1967; Moldenke, Phytologia 16: 87--88. 1968.

Rafinesque (1817) says "Verbena anonyma Bartr. trav. p. 136. Found by Bartram near Pointe Coupée: he says, that it is a beautiful species, with decumbent branches and lacerated deep green leaves, the branches bear corymbs of violet blue flowers. It grows in fields, in good soil, and blossoms in Autumn."

Cave (1960) gives the haploid chromosome number of this species as 15, but later (1964) as 10. Sharma & Mukhopadhyay (1963) refer to the corolla color as "red".

Additional citations: KANSAS: Douglas Co.: A. R. Moldenke 1429 (Z--photo).

VERBENA CANESCENS H.B.K.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2:

137. 1961; Moldenke, *Phytologia* 16: 88 & 103. 1968.

McVaugh found this plant abundant on limestone with Ceanothus, Ephedra, and Mimosa. The corolla was "purple" on R. McVaugh 23700.

The Hess & Hall 647, distributed as V. canescens, is actually var. roemeriana (Scheele) Perry.

Additional citations: MEXICO: Aguascalientes: R. McVaugh 23700 (Mi).

VERBENA CANESCENS var. ROEMERIANA (Scheele) Perry

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, *Phytologia* 15: 493 & 494 (1968) and 16: 103. 1968.

Cave (1961) reports the haploid chromosome number for this variety as 7 and the diploid number as 14. The corolla is described as "purple" on Hess & Hall 647 and these collectors call special attention to the fact that the bracts are "longer than the calyx".

Additional citations: MEXICO: Chihuahua: Moldenke & Moldenke 2097a (Z--photo, Z--photo). Nuevo León: Hess & Hall 647 (Mi).

VERBENA CAROLINA L.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, *Phytologia* 16: 88. 1968.

Cave (1961) reports the haploid chromosome number for this species as 7 and the diploid number as 14.

VERBENA CILIATA Benth.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, *Phytologia* 16: 88. 1968.

Cave (1961) reports the haploid chromosome number for this species as 7 and the diploid number as 14.

VERBENA CLOVERAE Moldenke

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, *Phytologia* 16: 89. 1968.

Cave (1961) reports the haploid chromosome number for this species as 15.

VERBENA CRITHMIFOLIA Gill. & Hook.

Additional bibliography: Fulling, Ind. Bot. Record. Bot. Review 563. 1967; Moldenke, *Phytologia* 16: 50. 1968.

VERBENA DELTICOLA Small

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, *Phytologia* 16: 89. 1968.

Cave (1961) reports the haploid chromosome number for this species as 7.

VERBENA EHRENBURGIANA Schau.

Additional bibliography: Cave, Pl. Ind. Chromosome Numb. 2:

137. 1961; Moldenke, *Phytologia* 16: 51. 1968.

Cave (1961) reports the haploid chromosome number for this species as 15.

VERBENA ELEGANS H.B.K.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2:

137. 1961; Moldenke, *Phytologia* 15: 492 & 493 (1968) and 16: 51--52. 1968.

Cave (1961) reports the haploid chromosome number for this species as 15 and the diploid number as 30.

VERBENA GOODINGII Briq.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 1: 48 (1960) and 2: 137. 1961; Moldenke, *Phytologia* 15: 486 (1968) and 16: 53--55. 1968.

Cave (1960) reports the haploid chromosome number for this species as 10.

VERBENA GOODINGII var. NEPETIFOLIA Tidestr.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, *Phytologia* 16: 54--55. 1968.

Cave (1961) reports the haploid chromosome number for this variety as 15.

VERBENA HALEI Small

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, *Phytologia* 16: 89. 1968.

Cave (1961) reports the haploid chromosome number for this species as 7 and the diploid number as 14.

VERBENA HASTATA L.

Additional & emended bibliography: Wolden, *Proc. Iowa Acad. Sci.* 39: 122. 1934; J. N. Martin, *Proc. Iowa Acad. Sci.* 50: 222, 224, & 227. 1943; L. J. Bradley, *Ferns & Flow. Pl. Audubon Cent.* 67. 1955; Solbrig, *Madroño* 15: 220. 1960; Cave, Ind. Pl. Chromosome Numb. 2: 63, 81, & 137. 1961; Mulligan, *Canad. Journ. Bot.* 39: 1061. 1961; Moldenke, *Phytologia* 16: 89--91. 1968.

Cave (1961) reports the haploid chromosome number for this species as 7 and the diploid number as 14.

Although the Wolden (1934) reference in the bibliography above is dated "1932", the late Dr. J. H. Barnhart has concluded that it was not actually published until 1934.

Martin (1943) informs us that seeds of the species under discussion stored at 14° (dry) showed no germination, but wet at the same temperature showed up to 25 percent germination; stored dry in the laboratory or wet outdoors they showed to 12 percent germination, but dry outdoors no germination at all.

xVERBENA HYBRIDA Voss

Additional synonymy: Verbena hybrida Voss ex Cave, Ind. Pl. Chromosome Numb. 1: i & 46, sphalm. 1958.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 1: i

& 46. 1958; Hellyer, Amat. Gard. Photo Album 184. 1961; Fulling, Ind. Bot. Record. Bot. Review 563. 1967; Moldenke, Phytologia 16: 92--94. 1968; Breck, Better Gardens 18. 1968.

Additional illustrations: Breck, Better Gardens 18 [in color]. 1968.

Cave (1958) reports the haploid chromosome number for this hybrid as 5. Hellyer (1961) lists a lavender-flowered cultivar called "Loveliness", a carmine "Lawrence Johnson", and a brilliant red "Firefly". Breck lists (1968) an "Amethyst Verbena" and describes it as 6 inches tall, slightly open-faced, with mid-blue flowers sparkling in twinkling profusion above cushions of foliage; compact habit, with 10--15-inch spread, strong-growing, drought-resisting, and annual, blooming all summer.

VERBENA INCISA Hook.

Additional bibliography: Moldenke, Phytologia 16: 93--95 & 185. 1968.

Krapovickas believes that V. calliantha Briq. represents the natural hybrid between this species and V. tenuisecta Briq. (cfr. xV. trinitensis Moldenke).

Additional citations: ARGENTINA: Formosa: Krapovickas 13087 (Rf).

VERBENA INTEGRIFOLIA Sessé & Moc.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, Phytologia 16: 95. 1968.

Cave (1961) reports the haploid chromosome number for this species as 21.

VERBENA LACINIATA (L.) Briq.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 1: Suppl. vii & 50 (1959) and 2: 331. 1964; Moldenke, Phytologia 16: 95--96. 1968.

Cave (1959) reports the haploid chromosome number for this species as 5 and (1964) the diploid number as 10.

VERBENA LASIOSTACHYS Link

Additional bibliography: Solbrig, Madroffo 15: 50. 1959; Cave, Ind. Pl. Chromosome Numb. 1: 48. 1960; Twisselmann, Wasmann Journ. Biol. 25: 98 & 327. 1967; Moldenke, Phytologia 16: 96--97 & 183. 1968.

Cave (1960) reports the haploid chromosome number for this species as 7. Twisselmann (1967) records the species from Kern County, California, and says "common in Douglas oak woodland in [the] Greenhorn Range, occasional through mountains south to Mil Potrereros in [the] San Emigdio Range", but I suspect that he is referring here to var. septentrionalis Moldenke.

VERBENA MACDOUGALII Heller

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, Phytologia 16: 99. 1968.

Cave (1961) reports the haploid chromosome number for this

species as 7.

VERBENA MEGAPOTAMICA Spreng.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 1: Suppl. vii & 50. 1959; Moldenke, Phytologia 16: 100. 1968.

Cave (1959) reports the haploid chromosome number for this species as 5.

VERBENA MENDOCINA R. A. Phil.

Additional bibliography: Fulling, Ind. Bot. Record. Bot. Review 563. 1967; Moldenke, Phytologia 16: 100. 1968.

VERBENA NEOMEXICANA (A. Gray) Small

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, Phytologia 16: 98 & 102--103. 1968.

VERBENA NEOMEXICANA var. HIRTELLA Perry

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, Phytologia 16: 102 & 103. 1968.

Cave (1961) reports the haploid chromosome number for this variety as 7.

VERBENA OFFICINALIS L.

Additional bibliography: M. A. Rau, Bull. Bot. Surv. India 3: 238. 1961; Deb, Bull. Bot. Surv. India 3: 315. 1961; Moldenke, Phytologia 16: 103--106 & 185. 1968.

Prior (1863) states that the common name for this plant, "simpler's joy", in England is in allusion to the "good sale they had for so highly esteemed a plant". Additional common names recorded for the plant in England are "countryman's treacle" [also applied to Ruta graveolens L.], "tears-of-Isis", and "tears-of-Juno".

Maheshwari (1963) describes this species as it grows in India as "An erect or decumbent, branching herb, 30--100 cm. tall. Young branches with minute, sparse prickles. Leaves 5--10 x 1.5--2.5 cm., variously lobed, scabrous; lower ones pinnatifid or coarsely toothed; upper ones usually deep dentate or tripartite. Flowers pale pink, in dense, bracteate spikes. Pyrenes dry, subcylindric, smooth. Common along canal banks, near temporary puddles and stagnant water channels. Flowers and Fruits: April--Oct." He cites Maheshwari 429 from Delhi. Banerji (1965) cites his collection no. 1069.

Karrer (1958) reports that up to 2 percent of stachyose, $C_{24}H_{42}O_{21}$, has been extracted from the roots of this plant. This substance, however, has been found also in such diverse plants as Catalpa bignonioides, Cicer arietinum, Clinopodium vulgare, Corylus avellana, C. colurna, Galega officinalis, Jasminum officinale, Lamium album, Leucaena glauca, Lithospermum purpureo-caeruleum, Lupinus luteus, Mentha silvestris, Origanum vulgare, Phaseolus vulgaris, Pinus thunbergii, Plantago carinata, P. maritima, Scrophularia nodosa, S. sambucifolia, Stachys tuberifera, Teucrium

canadense, Trifolium incarnatum, and Trigonella foenum-graecum. He also reports the presence of verbenalin, $C_{17}H_{24}O_{10}$, in Verbena officinalis.

Chopta, Badhwar, & Ghosh (1965) record the additional vernacular names "rai-el-hamam" [Arabic], "gasmashang" [Persian], "karaita" and "pamukh" [Punjab], and "faristarium" [Urdu]. They say of the plant: "It is found as a weed on waste lands and in gardens in the plains of the Punjab and Bengal (occasionally in Bihar also) rising up to an altitude of 7,000 ft. in the Himalayas from Kashmir eastwards.....The fresh leaves are used in the Punjab as a febrifuge, tonic, and as a rubifacient in rheumatism and other diseases of the joints. The root is believed to be a remedy for scrofula and snake bite. Overseas, the plant is stated to be used as a popular medicine in the treatment of fevers, colds, nervous disorders, pleurisy and dropsy. According to Pammel, the herb is an irritant poison.....The entire plant, twigs, leaves and flowers has yielded a crystalline glucoside verbanalin (cornin) to the extent of 0.244 per cent...In addition it contains another glucoside verbenin....Holste...found that verbanalin produces a stimulation of the motor activities of the central nervous system in frogs, followed in large doses by stupor, clonic and tetanic convulsions and finally paralysis. In mammals it produces little effect apart from the stimulation of the uterus, and increased tonus and a strengthening of the contractions of this organ. According to Kuwazima....verbanin in frogs acts upon the sympathetic nerve endings of the epidermal mucous glands and of the heart and vessels, and uterus and salivary glands; in mammals it produces a marked and prolonged secretion of milk."

Deb (1961) refers to this plant as an "undershrub" and says that it is abundant in the Manipur valley, citing his collection numbers 211 & 754, ascending to 1350 meters there. Rau (1961) cites his no. 10055 from Uttar Pradesh, India.

The Boissier (1879) reference in the bibliography of this species is sometimes cited as "1875", but the page involved was not issued until 1879. The H.B.K. references in the bibliography have been authenticated as to date by consultation of the work of Barnhart (1902) on this subject.

The DeWolf 743 and Edw. Palmer 1043, distributed as V. officinalis, are actually V. halei Small, while the Gauba 903 collection cited below is a mixture with Plumbago sp.

Additional citations: CONNECTICUT: New Haven Co.: Oakes s.n. (Ms--3201). NEW YORK: Bronx Co.: A. Brown s.n. [Hunter's Point, Aug. 10, 1879] (Ms--79258). NEW JERSEY: Hudson Co.: A. Brown s.n. [Jersey City, Sept. 11, '78] (Ms--78114). PENNSYLVANIA: Philadelphia Co.: E. Durand s.n. [near Philad.] (Ms--30803). VIRGINIA: Bedford Co.: Curtiss s.n. [July 1, 1870] (Ms--30801). Smyth Co.: J. K. Small s.n. [July 6, 1892] (Ms--30800). NORTH CAROLINA: County undetermined: LeRoy s.n. [June '72] (Ms--30805). COLOMBIA: Valle del Cauca: Holton 504 (Ms--30799). GREAT BRITAIN: England:

Raven & Cannon 16432 (Du—475086); J. Ray s.n. [Epping, 27-7-40] (Ms—30806). GERMANY: Degener & Degener 23405 (Ms—43960); Herb. F. J. Young K.664 (Ws); Wunderly s.n. (Ws). SWITZERLAND: Thomas s.n. (Ms—30797). IRAN: Gauba 903, in part (B). CHINA: Szechuan: Fang 1680 (Du—336014), 5201 (Du—333776). THAILAND: Larsen, Smitinand, & Warncke 1021 (Ac, Rf). LOCALITY OF COLLECTION UNDETERMINED: Herb. Amherst Coll. s.n. (Ms—30798).

xVERBENA OKLAHOMENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 10: 282—284. 1964; Hocking, *Excerpt. Bot. A.10*: 270. 1966.

VERBENA ORCUTTIANA Perry

Additional bibliography: Moldenke, *Phytologia* 11: 475. 1965; Hocking, *Excerpt. Bot. A.10*: 270. 1966.

VERBENA ORIGENES R. A. Phil.

Additional bibliography: Hocking, *Excerpt. Bot. A.10*: 270. 1966; Moldenke, *Phytologia* 13: 213. 1966; Moldenke, *Résumé Suppl.* 15: 5. 1967.

The Herb. Mus. Nac. Hist. Nat. Santiago 6 and Werdermann 959 cited by me as typical V. origenes in a previous installment of these notes are actually var. glabriflora Moldenke.

VERBENA ORIGENES var. GLABRIFLORA Moldenke, *Résumé Suppl.* 15: 5, nom. nud. (1967), var. nov.

Haec varietas a forma typica speciei corollis extus glabris recedit.

This variety differs from the typical form of the species in having the outer surface of the corolla glabrous.

The type of the variety was collected by Otto Zöllner (no. 1238) on dry slopes of the valleys at Monturaqui, at an altitude of 3600 meters, Antofagasta, Chile, on January 18, 1967, and is deposited in my personal herbarium at Plainfield, New Jersey. The collector notes that the plant was "abundant" at the type locality. The variety has also been found at 3800 meters altitude in Atacama.

Citations: CHILE: Antofagasta: Zöllner 1238 (Z--type). Atacama: Werdermann 959 (N). Province undetermined: Herb. Mus. Nac. Hist. Nat. Santiago 6 (N).

VERBENA OVATA Cham.

Additional bibliography: Hocking, *Excerpt. Bot. A.10*: 270. 1966; Moldenke, *Phytologia* 14: 292. 1967.

VERBENA PARODII (Covas & Schnack) Moldenke

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14360. 1958; Hocking, *Excerpt. Bot. A.10*: 270. 1966; Moldenke, *Phytologia* 14: 292. 1967.

VERBENA PARVULA Hayek

Additional bibliography: Moldenke, Phytologia 14: 288, 292—293, & 301. 1967; Moldenke, Résumé Suppl. 15: 3 & 5. 1967.

VERBENA PAULSENI R. A. Phil.

Additional bibliography: Moldenke, Phytologia 11: 476. 1965; Moldenke, Résumé Suppl. 15: 5. 1967.

Additional citations: CHILE: Coquimbo: Zöllner 1489 (Z).

VERBENA PERAKII (Covas & Schnack) Moldenke

Additional synonymy: Glandularia perackii Covas & Schnack ex Solbrig, Madroño 15: 50, sphalm. 1959.

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14360. 1958; Solbrig, Madroño 15: 50. 1959; Cave, Ind. Pl. Chromosome Numb. 1: 48. 1960; Hocking, Excerpt. Bot. A.10: 270. 1966; Moldenke, Phytologia 14: 293. 1967.

Cave (1960) reports the haploid chromosome number for this species as 5.

VERBENA PERENNIS Wooton

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Solbrig, Madroño 16: 267. 1962; Cave, Ind. Pl. Chromosome Numb. 2: 216. 1963; Moldenke, Phytologia 13: 253. 1966; Hocking, Excerpt. Bot. A.10: 270. 1966.

Weber & Cronquist found this plant growing on a gravelly hill-top in New Mexico. Cave (1961, 1963) reports the haploid chromosome number for this species as 7.

Additional citations: NEW MEXICO: Eddy Co.: Weber & Cronquist 11477 (Du—498715). Lincoln Co.: Wooton 187 (Ms—30807—isotype). Sierra Co.: O. B. Metcalfe 1568 (Ms—33492, Ws).

VERBENA PERENNIS var. JOHNSTONI Moldenke

Additional bibliography: Moldenke, Phytologia 13: 214. 1966; Hocking, Excerpt. Bot. A.10: 270. 1966.

xVERBENA PERRIANA Moldenke

Additional & emended bibliography: Wolden, Proc. Iowa Acad. Sci. 39: 122—123. 1934; Hocking, Excerpt. Bot. A.10: 270. 1966; Gaiser & Moore, Surv. Vasc. Pl. Lambton Co. 100—101. 1966; Boivin, Naturaliste Can. 93: 429. 1966; Moldenke, Phytologia 13: 253 (1966) and 16: 51. 1968.

Wolden (1934) notes under V. bracteata that "specimens collected on river bank at Estherville [Emmet County, Iowa] resemble V. officinalis somewhat, but are probably hybrids between V. urticaefolia and V. bracteosa". This reference appears to be dated "1932" but according to notes left by the late Dr. J. H. Barnhart was probably not actually published until 1934.

Additional citations: MINNESOTA: Ramsey Co.: A. Brown s.n. [Fort Snelling, Aug. '93] (Ms—30771). MISSOURI: Saint Louis: Eggert s.n. [DeHodiamont Av., 4 August 1875] (Ms—30837).

xVERBENA PERTURBATA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 215. 1966; Hocking, Excerpt. Bot. A.10: 270. 1966.

VERBENA PERUVIANA (L.) Britton

Additional synonymy: Verbena chamaedryfolia var. melindres Gill. ex Bonstedt, Pareys Blumengärtn., ed. 1, 273. 1932. Verbena chamaedryfolia var. melindroides Cham. ex Bonstedt, Pareys Blumengärtn., ed. 1, 273. 1932. Verbena chamaedryfolia var. latifolia Hort. ex Bonstedt, Pareys Blumengärtn., ed. 1, 273, in syn. 1932. Verbena peruviana cv. "Melindres" Maatsch in Encke, Pareys Blumengärtn., ed. 2, 441. 1960. Verbena peruviana cv. "Melindroides" Maatsch in Encke, Pareys Blumengärtn., ed. 2, 441. 1960.

Additional & emended bibliography: Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: 404. 1881; Lorentz & Niederlein, Bot. Exped. Rio Negro 263. 1881; Duthie, Fl. Upper Gang. Plain 2: 218. 1911; Haines, Bot. Bihar & Orissa 4: 707. 1922; Gamble, Fl. Presid. Madras 6: 1106. 1924; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 628, 629, & 848 (1924), pr. 2, 628, 629, & 848. 1925; H. C. Conner, Gard. Chron., ser. 3, 92: 373. 1932; Bonstedt, Pareys Blumengärtn., ed. 1, 273. 1932; Anon., Ind. Sem. Ofr. Canje Jard. Bot. Montev. 8. 1935; Sampaio, Bol. Mus. Nac. Rio Jan. 13: 190, 249, & 292. 1937; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 628, 629, & 848 (1938), pr. 4, 628, 629, & 848 (1944), and ed. 2, 840, 841, & 1113. 1949; Cave, Ind. Pl. Chromosome Numb. 1: Suppl. vii & 50. 1959; Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 440 & 441. 1960; Chopra, Badhwar, & Ghosh, Poison. Pl. India 2: 694. 1965; Hocking, Excerpt. Bot. A.10: 270. 1966; J. F. Williamson, Sunset West. Gard. Book, new ed., 437. 1967; Zukowski, Fl. Polska 11: 65. 1967; Moldenke, Phytologia 14: 293 (1967) and 16: 89, 93, 94, & 188. 1968.

Williamson (1967) says of this plant: "perennial, often grown as annual, available in several colors" and lists the horticultural varieties "Appleblossom", "Cherry Pink", and "Princess Gloria", all with salmon tones to the corollas, and comments that there are many other varieties in purplish and red and in white, especially popular in southern California gardens and in desert areas. Obviously he is here referring in toto to xV. hybrida Voss and not to V. peruviana! It also seems most probable that the plants referred to by Duthie (1911), Haines (1922), and Gamble (1924) is xV. hybrida. Zukowski (1967) records "V. chamaedryfolia Juss." as both cultivated and escaped in Poland, but it is also very possible that xV. hybrida is here being referred to.

Bonstedt (1932) records the German common name "germänder-blättrigeres Eisenkraut" for V. peruviana. Maatsch (1960) cites as illustrations "B. M. 3333; B. C. 3: 3445, beide als V. chamaedryfolia; Chittenden, Dict. 4: 2212", and continues: "Diese Art ist die älteste Stammform unserer Gartenverbänen. cv. 'Melindres'. Blätter länglich oder länglich-lanzettlich, ungleich eingeschnit-

ten gestägt, weniger stark kurz-rauhhaarig. — B. R. 1148. cv. 'Melindroides'. Blätter eiförmig, ziemlich gleichmässig oder doppelt-gekerbt-gestägt, stärker kurz-rauhhaarig. (K) Verwendung wie die aus ihr hervorgegangenen Hybriden. Kultur, wie bei V. bonariensis angegeben, durch Aussaat oder auch durch Stecklinge."

Cave (1959) reports the haploid chromosome number for this species as 7.

The Monetti s.n. [Herb. Inst. Miguel Lillo 31354] and Woolston 731, distributed as V. peruviana, are actually V. incisa Hook.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo 42606 (B), 48727 (B), 51348 (B). URUGUAY: Herb. Herter 32160 (Ws); Herter 19b [Herb. Herter 71313] (Ws).

VERBENA PHLOGIFLORA Cham.

Additional synonymy: Verbena phlogifolia Regel ex Bonstedt, Pareys Blumengärtn., ed. 1, 2: 274, in syn. 1932. Ververna phlogiflora Cham., in herb.

Additional bibliography: L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 628, 629, & 849 (1924) and pr. 2, 628, 629, & 849. 1925; Bonstedt, Pareys Blumengärtn., ed. 1, 2: 274 & 275. 1932; Tu, Chinese Bot. Dict., abrdg. ed., 718. 1933; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 628, 629, & 849 (1938) and pr. 4, 628, 629, & 849. 1944; Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 440 & 441. 1960; Behm, Fl. Um Uns 51 & 287. 1966; Moldenke, Phytologia 14: 293 (1967) and 16: 89, 93, 94, & 100. 1968.

Bonstedt (1932) records the German popular name "phloxblütiges Eisenkraut" for this species. Maatsch (1960) describes the taxon as follows: "Barsilien, Paraguay, Uruguay, Argentinien. Sommer—Herbst. Staudig-halbstrauchig, der vorigen Art ähnlich; Wuchs kräftiger, Stengel aufstrebend. Äste kreuzgegenständig, vierkantig, mit nach abwärts gerichteter Behaarung. Blätter breiter, meist deutlich gestielt, aus keilförmigem, ganzrandigem Grunde länglich- oder lanzettlich-dreieckig, spitz, am Rande fast umgerollt, ungleich-eingeschnitten-gestägt, runzeladerig, stielgelhaarig. Blüten in endständigen, einzeln oder zu dritt stehenden oder trugdoldig-rispigen Blütenständen, grösser als bei V. peruviana. Deckblätter halb so lang wie der drüsige und behaarte Kelch, leuchtend purpurn, lila, rot oder blau. — 1834. B. M. 3541; B. C. 4: 3445. Auch diese Art ist an der Entwicklung des Sortiments der Gartenverbena beteiligt; eine Kreuzung mit V. peruviana ergab die scharlachrote 'Défiance'. (K) Verwendung für bunte Beete, auch als Topfpflanze im Kalthaus. Anzucht durch Samen wie bei V. bonariensis oder auch durch Stecklinge."

The Rambo, Herb. Anchieta 49084, distributed as V. phlogiflora and so cited by Rambo (1965), is actually V. pulchra Moldenke, while 53369 is V. peruviana (L.) Britton.

Additional citations: BRAZIL: Paraná: Hatschbach 14769 (Rf), 14967 (Ac). Rio Grande do Sul: Rambo, Herb. Anchieta 59244 (B), s.n. [3.11.1954] (B). ARGENTINA: Corrientes: Ruiz Huidobro 4408

(Ms--34321).

VERBENA PINETORUM Moldenke

Additional bibliography: Moldenke, *Phytologia* 13: 216. 1966.

West describes this plant as an annual herb, growing along roadsides and in woods, blooming in June. The corollas on R. C. West D.2 are described as "violet", while those on R. C. West D.2 were "purple".

Additional citations: MEXICO: Hidalgo: R. C. West A.1 (Z), D.2 (Ws).

VERBENA PLATENSIS Spreng.

Additional bibliography: Hieron., *Bol. Acad. Nac. Cienc. Córdoba* 4: 404--405 & 408. 1881; Lorentz & Niederlein, *Bot. Exped. Rio Negro* 263--264. 1881; L. H. Bailey, *Man. Cult. Pl.*, ed. 1, pr. 1, 628, 629, & 849 (1924), pr. 2, 628, 629, & 849. 1925; Bonstedt, *Pareys Blumengärtn.*, ed. 1, 2: 274--275. 1932; L. H. Bailey, *Man. Cult. Pl.*, ed. 1, pr. 3, 628, 629, & 849 (1938) and pr. 4, 628, 629, & 849. 1944; Maatsch in Encke, *Pareys Blumengärtn.*, ed. 2, 2: 440 & 441. 1960; Behm, *Fl. Um Uns* 51 & 287. 1966; Moldenke, *Phytologia* 14: 293--294 (1967) and 16: 93. 1968.

Bonstedt (1932) records the German popular name, "gamander-Eisenkraut", for this species. He and Maatsch (1960) maintain that this species crossed with V. phlogiflora Cham. has yielded the "aurikelblütigen Verbenen" [V. hybrida var. auriculiflora Hort., etc.], which I regard as typical xV. hybrida Voss. Maatsch comments as follows: "Aus Kreuzungen dieser Art mit V. phlogiflora entstanden die grossblütigen Kulturformen, deren Blüten in der Mitte ein grosses, weisses Auge besitzen. Sie wurden als 'aurikelblütige' Verbenen in den Handel gebracht, werden aber heute in den Katalogen nicht mehr gesondert geführt. (K) Verwendung und Kultur wie V. x hybrida."

The Herb. Univ. Wisc. s.n., distributed as V. platensis, is actually Lantana montevidensis (Spreng.) Briq.

VERBENA PLATENSIS var. STENODES Briq.

Additional bibliography: Moldenke, *Phytologia* 11: 9--10. 1964.

Additional citations: ARGENTINA: Catamarca: Rodriguez Vaquero 899 (Ms--34322). Córdoba: Hieronymus s.n. [Bei San Antonio, 6.I. 1876] (B); Meyer & Sleumer 15654 (B).

VERBENA PLICATA Greene

Additional bibliography: Solbrig, *Madroffio* 16: 267. 1962; Cave, *Ind. Pl. Chromosome Numb.* 2: 137 (1961) and 2: 216. 1963; Moldenke, *Phytologia* 14: 290 & 294 (1967) and 15: 493. 1968.

The corollas are described as "blue" on S. S. White 1937. Cave (1961) reports the haploid chromosome number for this species as 7.

Additional citations: ARIZONA: Pima Co.: Pringle s.n. [near Pantano, June 14, 1881] (Ms--30780). MEXICO: Coahuila: S. S.

White 1937 (Mi).

VERBENA POGOSTOMA Klotzsch

Additional bibliography: Moldenke, Biol. Abstr. 47: 8471. 1966; Moldenke, Phytologia 14: 294. 1967; Hocking, Excerpt. Bot. A.11: 103. 1967.

VERBENA PULCHELLA Sweet

Additional bibliography: Shinnars, Sida 2: 442 & 448. 1966; Solbrig, Biol. Abstr. 47: 2870. 1966; Moldenke, Phytologia 14: 294. 1967.

The Herter 1805 [Herb. Herter 96556], cited below, was previously incorrectly cited by me as V. dissecta f. alba Moldenke.

Additional citations: URUGUAY: Herter 1805 [Herb. Herter 96556] (Du--373695).

VERBENA PULCHELLA var. CLAVELLATA (Troncoso) Shinnars

Additional bibliography: Shinnars, Sida 2: 442 & 448. 1966; Moldenke, Phytologia 14: 294. 1967.

VERBENA PULCHRA Moldenke

Additional bibliography: Moldenke, Phytologia 13: 256 (1966) and 16: 100 & 194. 1968.

Rambo has found this plant growing in small woods on plains and in rather wet shrubby places. Material has been misidentified and distributed to herbaria by him, as well as cited by him (1965), as V. megapotamica Spreng. and V. phlogiflora Cham.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo, Herb. Anchieta 49084 (B), 54947 (B).

VERBENA PUMILA Rydb.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Rickett, Wild Fls. U. S. 2 (2): 462 & 686. 1967; Moldenke, Résumé 15: 2. 1967; Moldenke, Phytologia 14: 294 (1967), 15: 488 (1968), and 16: 48. 1968.

Cave (1961) reports the haploid chromosome number for this species as 10. The corolla is described as "blue" on Hess & Hall 656 and these collectors describe the plant as a "trailing annual". The Reverchon s.n. [Curtiss 1963**] collection, cited below, is a mixture with V. ciliata Benth. and V. bonariensis L.

Additional citations: OKLAHOMA: Murray Co.: Hopkins, Nelson, & Nelson 159 (Du--320932), 905 (Du--351542). TEXAS: Dallas Co.: J. Reverchon s.n. [Curtiss 1963**, in part] (Ms--30784). Grayson Co.: H. Gentry 50-94 (Ms--34281). Travis Co.: Armer s.n. [Colorado R., 4-2-29] (Du--363715). Val Verde Co.: Tharp & Havard 49360 (Ms--34325). MEXICO: Nuevo León: Hess & Hall 656 (Mi).

VERBENA QUADRANGULATA Heller

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, Phytologia 14: 294. 1967; Rickett, Wild Fls.

U. S. 2 (2): 462 & 686. 1967.

Dominguez M. & McCart found this plant growing in a wet place at the water's edge in Tamaulipas. Cave (1961) reports its haploid chromosome number as 10.

Additional citations: TEXAS: Kleberg Co.: M. C. Johnston 5441 (Ms--44074). Nueces Co.: A. A. Heller 1388 (Ms--30816--isotype). MEXICO: Tamaulipas: Dominguez M. & McCart 8182 (Du--511275).

VERBENA RACEMOSA Eggert

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, Phytologia 14: 294. 1967.

Cave (1961) reports the haploid chromosome number for this species as 10.

Additional citations: TEXAS: Hudspeth Co.: Tharp & Havard 24294 (Ms--34326).

VERBENA RAMBOI Moldenke

Additional bibliography: Moldenke, Phytologia 14: 295. 1967.

The Rambo, Herb. Anchieta 25786, distributed as V. ramboi by Rambo and so cited by him (1965), is actually V. stellarioides Cham.

VERBENA RECTA H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 224. 1817.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 224 (1817) and ed. quart., 2: 277. 1818; J. E. Gonzalez, Revist. Cientif. Mex. 1 (14): 17. 1881; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Moldenke, Phytologia 14: 295. 1967.

The corollas on H. E. Moore 3428 are described as "deep-blue" and the plant was found growing in meadows. Gonzalez (1881) records the vernacular name "yerba del cristo" for this species.

It should be noted that the H.B.K. reference dates, as corrected above, have been authenticated by consultation of the work by Barnhart (1902).

Additional citations: MEXICO: Morelos: H. E. Moore 3428 (Ws). Oaxaca: Pringle 4769 (Ms--30845).

VERBENA REITZII Moldenke

Additional bibliography: Moldenke, Phytologia 14: 295 (1967) and 16: 102. 1968.

This species has been found growing in shrubby marshes, flowering in January.

Additional citations: BRAZIL: Santa Catarina: Rambo, Herb. Anchieta 60193 (B).

VERBENA RIGIDA Spreng.

Additional & emended bibliography: A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 338 (1878) and ed. 2, 2 (1): 338. 1886; Gamble, Fl. Presid. Madras 6: 1106. 1924; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 628, 629, & 849 (1924) and pr. 2, 628, 629, & 849. 1925;

McCallan, Flow. Gard. Calend. 18. 1927; T. H. Everett, Gard. Chron. Amer. 35: 179. 1931; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 1, 153 & 241. 1932; H. C. Comber, Gard. Chron., ser. 3, 92: 373. 1932; Bonstedt, Pareys Blumengärtn., ed. 1, 2: 274 & 275. 1932; I. N. Anderson, Nat. Hort. Mag. 12: 72. 1933; Anon., Ind. Sem. Ofr. Canje Jard. Bot. Montev. 8. 1935; Rendle, Notes Fl. Bermuda 16. 1937; C. Cheymol, Journ. Pharm. Chim. 1937: [8], 25, & 110. 1937; C. Cheymol, Chem. Centralbl. 2: 1020. 1937; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 628, 629, & 849 (1938), pr. 4, 628, 629, & 849 (1944), and ed. 2, 840 & 1113. 1949; Karrer, Konstit. & Vork. Organ. Pflanzenst. 279. 1958; Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 441—442. 1960; Hellyer, Amat. Gard. Photo Album 184. 1961; Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1054 & 1453. 1962; Jiménez, Supl. Cat. Fl. Doming. 1: 220—221. 1966; Gaiser & Moore, Surv. Vasc. Pl. Lambton Co. 100. 1966; Batten & Bokelmann, Wild Fls. East. Cape Prov. 125 & pl. 99 (9). 1966; R. H. Compton, Journ. S. Afr. Bot. Suppl. 6: 157. 1966; J. F. Williamson, Sunset West. Gard. Book, new ed., 437. 1967; M. Raymond, Ann. Résult. Jard. d'Essai Jard. Bot. Montreal 1966: 61. 1967; Zukowski, Fl. Polska 11: 65. 1967; Rickett, Wild Fls. U. S. 2 (2): 462, 463, & 686, pl. 170. 1967; Moldenke, Phytologia 14: 295 (1967) and 16: 91. 1968.

Additional illustrations: Bonstedt, Pareys Blumengärtn., ed. 1, 2: 275. 1932; Batten & Bokelmann, Wild Fls. East. Cape Prov. pl. 99 (9) [in color]. 1966; Rickett, Wild Fls. U. S. 2 (2): pl. 170 [in color]. 1967.

The corolla is described as "violet" on Krapovickas & Cristóbal 12056 and as "brilliant purple" on DeWolf 741. Compton (1966) records the species from Swaziland, while Zukowski (1967) tells us that it is both cultivated and escaped in Poland. Bonstedt (1932) records the German common name, "geadertes Eisenkraut", for the species.

Maatsch (1960) says for this plant: "Blüten in anfangs doldenförmigen, dann bald verlängerten, gewöhnlich zu dritt beisammenstehenden, gestielten, gleich hohen Ähren, violett. cv. 'Lilacina'. Blüten dunkellila. Deckblätter pfriemlich, bewimpert, samt dem 3 oder 4 mm langen Kelch gefärbt und ihn überragend. Kronröhre schlank, dreimal so lang wie der Kelch. — 1830. B. M. 3127; Hegi V/3: 2240; Parey I. 2: 275; alle als V. venosa. (K) Diese Art gehört zu den dankbarsten Beetpflanzen und wird ebenso bei bunten Pflanzungen wie auch für Farbenbeete -- etwa zusammen mit Salvia splendens und Senecio cineraria (Cineraria maritima) -- gern verwendet. Anzucht durch Aussaat im März lauwarm; später in Kisten pikierten oder besser in kleine Torftöpfe. Kultur in Einheitserde oder Cyclamen-erde, zuletzt luftig in Kästen, nach Mitte Mai auspflanzen. Der Samen keimt unregelmässig, 1 g hat 1200 Korn. In nicht zu rauen Gegenden ist diese Art unter Schutzdecke winterhart. Sie kann auch durch Wurzelschnittlinge vermehrt werden. Aussaat ist einfacher und führt schneller zu grossen Sätzen."

Karrer (1958) reports that up to 2 percent of stachyose,

$C_{24}H_{42}O_{21}$, has been extracted from the roots of this species. This substance, however, has also been obtained from such diverse plants as Ballota foetida, Catalpa bignonioides, Cicer arietinum, Clinopodium vulgare, Corylus avellana, C. colurna, Galega officinalis, Jasminum officinale, Lamium album, Leucaena glauca, Lithospermum purpureo-caeruleum, Lupinus luteus, Mentha silvestris, Origanum vulgare, Phaseolus vulgaris, Pinus thunbergii, Plantago carinata, P. maritima, Scrophularia nodosa, S. sambucifolia, Soja hispida, Sphagnum palustre, Stachys tuberosa, Teucrium canadense, Trifolium incarnatum, Trigonella foenum-graecum, and Verbascum thapsiforme.

Williamson (1967) maintains that Verbena rigida is a good plant for low maintenance gardens, blooming in 4 months from seed. Raymond (1967) refers to a cultivar named "Violet Clair". Hellyer (1961) refers to the species as a fairly hardy perennial with suckers. Batten & Bokelmann (1966) describe it as a slender perennial, growing in groups, occasional in grasslands and along roadsides throughout South Africa, as an escape from cultivation, flowering there from October to March. Cave (1961) reports its diploid chromosome number as 42.

Material has been misidentified and distributed in herbaria as V. hirta Spreng. On the other hand, the Pratibha s.n., distributed as V. rigida, is actually V. tenuisecta Briq.

Additional citations: GEORGIA: Calhoun Co.: R. F. Thorne 3597 (Ml). ALABAMA: Mobile Co.: C. Mohr 68 (Ms--30827). LOUISIANA: Saint Tammary Par.: DeWolf 741 (Ms--34329); Ewan 17797 (Rf), 20229 (Ac). TEXAS: Travis Co.: Tharp s.n. [Austin, 5/2/35] (Du--362693). BRAZIL: Paraná: Hatschbach 14511 (Ac). Rio Grande do Sul: O. Camargo 1944 [Herb. Anchieta 62059] (B); Rambo, Herb. Anchieta 53021 (B), 56783 (B), 57248 (B). ARGENTINA: Misiones: Krapovickas & Cristóbal 12056 (W--2481386); Medina 37 (Du--330770); G. J. Schwarz 1249 (Ms--34327). CULTIVATED: Germany: Herb. Univ. Wisc. s.n. (Ws); Wagenitz s.n. [Mus. Bot. Berol. Gartenherb. W. 377] (Rf).

VERBENA RIGIDA var. LILACINA (Benary & Bodger) Moldenke

Additional synonymy: Verbena rigida cv. "Lilacina" Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 441. 1960.

Additional bibliography: L. H. Bailey, Man. Cult. Pl., ed. 2, 840 & 1113. 1949; Moldenke, Phytologia 11: 479. 1965.

VERBENA RIPARIA Raf.

Additional bibliography: Rickett, Wild Fls. U. S. 2 (2): 464 & 686. 1967; Moldenke, Phytologia 14: 295--296. 1967.

Additional citations: VIRGINIA: Smyth Co.: J. K. Small s.n. [about Marion, July 20, 1892] (Ms--30824).

VERBENA ROBUSTA Greene

Additional bibliography: Moldenke, *Phytologia* 11: 479. 1965; Twisselmann, *Wasmann Journ. Biol.* 25: 327. 1967; Moldenke, *Phytologia* 16: 96 & 102. 1968.

Recent collectors have found this plant growing in rich black soil, in alluvial wash, along sandy creek banks, and in creek bottoms with Rhus diversiloba, Sambucus sp., Quercus agrifolia, Holodiscus discolor, Clematis ligusticifolia, and Salix sp. The corollas are described as "blue" on Breedlove 2856.

Twisselmann (1967) records this species from Kern County, California, and says "small colony grown since at least 1956 in mud in full sun at edge of small pool on McGovern Grade in Temblor Range (T 1535). Owner of land who has known area intimately since early 1900's said that it was never seen before anywhere in area."

The Breedlove 4164, distributed as V. robusta, is actually V. lasiostachys var. septentrionalis Moldenke, while K. L. Chambers 728 is V. neomexicana (A. Gray) Small.

Additional citations: CALIFORNIA: San Luis Obispo Co.: C. B. Wolf 3614 (Du--340733). Santa Barbara Co.: Breedlove 833 (Du--488619). Santa Clara Co.: J. H. Thomas 4309 (Du--385226). CHANNEL ISLANDS: Santa Catalina: I. L. Wiggins 1763 (Du--457189). Santa Cruz: Breedlove 2856 (Du--489349).

xVERBENA RYDBERGII Moldenke

Additional synonymy: xVerbena paniculatastricta Eng. apud Boivin, *Naturaliste Can.* 93: 429. 1966.

Additional & emended bibliography: Gaiser & Moore, *Surv. Vasc. Pl. Lambton Co.* 100. 1966; Boivin, *Naturaliste Can.* 93: 429. 1966; Moldenke, *Phytologia* 14: 296. 1967; Moldenke, *Résumé Suppl.* 15: 1, 2, & 24. 1967.

Boivin (1966) records this hybrid from Kazabazua in Gatineau County, Quebec -- the specimens deposited in the Phanerogamic Herbarium of the Plant Research Station at Ottawa. The A. R. Moldenke 819 specimens, cited below, were previously cited by me as deposited in my personal herbarium

Additional & emended citations: ILLINOIS: Henderson Co.: H. N. Patterson s.n. [Oquawka, July] (Ms--30839, Ms--30840). Macon Co.: A. R. Moldenke 819 (Ac, B, Ms, Rf, Ws). MISSOURI: Saint Louis: Eggert s.n. [DeHordiamont Av., 4 August 1875] (Ms--30834).

VERBENA SANTIAGUENSIS (Covas & Schnack) Moldenke

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14360. 1958; Moldenke, *Phytologia* 14: 296. 1967.

VERBENA SCABRA Vahl

Additional bibliography: A. Gray, *Syn. Fl. N. Am.*, ed. 1, 2 (1): 335 (1878) and ed. 2, 2 (1): 335. 1886; Jacks, in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 2: 1179 (1895), pr. 2, 2: 1179 (1946), and pr. 3, 2: 1179. 1960; J. E. Moore, *Castanea* 30: 26. 1965;

Moldenke, Résumé Suppl. 15: 2. 1967; Rickett, Wild Fls. U. S. 2 (2): 464. 1967; Moldenke, Phytologia 14: 296 & 300 (1967) and 15: 495. 1968.

The C. B. Wolf 3614, distributed as V. scabra, is actually V. robusta Greene.

Additional citations: GEORGIA: Sapelo Island: W. H. Duncan 20268 (Ws). FLORIDA: Dade Co.: H. N. Moldenke 24114 (Ac, Rf, Ws). ARIZONA: Pima Co.: Pringle s.n. [July 18, 1884] (Ms--30810). CALIFORNIA: Los Angeles Co.: L. C. Wheeler 2181 (Ms--79259). San Bernardino Co.: Parish & Parish 1043 (Ms--30809). MEXICO: Coahuila: Edw. Palmer 1040 (Ms--30811).

VERBENA SCABRA f. ANGUSTIFOLIA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 296--297. 1967; Moldenke, Résumé Suppl. 15: 2. 1967.

VERBENA SEDULA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 280 & 297 (1967) and 15: 495. 1968.

Wiggins & Porter 660 is said to have had "white" corollas and is described as 60 cm. tall, flowering in February, at 740 meters altitude.

Emended citations: GALAPAGOS ISLANDS: Indefatigable: R. I. Bowman 81 (Gg--461129--isotype); Wiggins & Porter 660 (Z).

VERBENA SELLOI Spreng. in L., Syst. Veg., ed. 16, 2: 750. 1825.

Additional synonymy: Shuttleworthia selloi (Spreng.) Walp., Repert. Bot. Syst. 4: 13. 1845. Shuttleworthia selloi Walp. apud Schau. in A. DC., Prodr. 11: 553, in syn. 1847. Shuttleworthia selloi Walp. ex Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 895, in syn. 1895. Schuttleworthia selloi Walp. ex Briq., Ann. Conserv. & Jard. Bot. Genève. 7-8: 296, in syn. 1904.

Additional bibliography: Shinnars, Sida 2: 448. 1966; Moldenke, Phytologia 14: 297 (1967) and 16: 51 & 96. 1968.

The O. Camargo 2022 [Herb. Anchieta 62124], cited below, was previously cited by me, in error, as V. tenera Willd.

Additional citations: BRAZIL: Rio Grande do Sul: O. Camargo 2022 [Herb. Anchieta 62124] (B); Sehnem 2128 [Herb. Anchieta 48478] (B). URUGUAY: Herter 181c [Herb. Herter 79227] (Ws).

VERBENA SESSILIS (Cham.) Kuntze

Additional bibliography: Moldenke, Phytologia 13: 264. 1966.

Additional citations: ARGENTINA: Formosa: Krapovickas & Cristóbal 13184 (Z).

VERBENA SETACEA Perry

Additional bibliography: Moldenke, Phytologia 11: 156--157. 1964.

Recent collectors have found this plant growing in talus slopes

at the base of basalt cliffs, at 100 feet altitude, flowering in February and October, and describe it as a small suffrutescent perennial. The corollas on I. L. Wiggins 15074 are described as having been "purplish", while those on Wiggins & Thomas 187 were "pinkish-lavender".

Material has been misidentified and distributed in herbaria as V. gooddingii var. gooddingii.

Additional citations: MEXICO: Baja California: I. L. Wiggins 15074 (Du--453237); Wiggins & Thomas 187 (Du--508510).

VERBENA SIMPLEX Lehm.

Additional & emended bibliography: A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 336 (1878) and ed. 2, 2 (1): 336. 1886; Marie-Victorin, Fl. Laurent., ed. 2, 490. 1964; Mohlenbrock & Voigt, Trans. Ill. Acad. Sci. 58 (4): 295. 1965; Gaiser & Moore, Surv. Vasc. Pl. Lambton Co. 100. 1966; Boivin, Naturaliste Can. 93: 429. 1966; Hartley, Univ. Iowa Stud. Nat. Hist. 21: 144. 1966; Moldenke, Phytologia 14: 297. 1967; Lehr, Bull. Torrey Bot. Club 94: 544. 1967; Moldenke, Résumé Suppl. 15: 1. 1967; Rickett, Wild Fls. U. S. 2 (2): 464, 465, & 686, pl. 171. 1967.

Additional illustrations: Rickett, Wild Fls. U. S. 2 (2): pl. 171 [in color]. 1967.

Isely found this plant growing along roadsides in Arkansas. Hartley reports it from dry usually sandy soil in Allamakee and Lafayette Counties, Iowa, but notes that it is "rare" there. Mohlenbrock & Voigt (1965) cite Mohlenbrock 12636 from Illinois. Macoun (1884) tells us that the species grows "On dry limestone soils locally abundant" in Canada. He cites Holmes s.n. from the island above Nun's Island, Montreal, 1821; MacLagen s.n. from St. Helen's Island, Montreal; McGill Coll. Herb. s.n. from Strathroy [Middlesex County] and Port Colborne [Welland County], Ontario; Burgess s.n. from the vicinity of Whitby [Ontario County], Ontario; and his own collections leading him to comment "Abundant in dry rocky fields around Belleville [Hastings County], and on rocky ground at Shannonville station [Hastings County], G. T. R.; also very common in the open woods on Massassaga Point, Prince Edward County," Ontario.

Material has been misidentified and distributed in herbaria as Lobelia canbyi A. Gray.

Additional citations: MASSACHUSETTS: Hampshire Co.: Hitchcock s.n. [So. Hadley] (Ms--50705); Jesup s.n. [July 27, 1871] (Ms--45388, Ms--45389); C. H. K. Sanderson 1955 (Ms--72457); W. E. Stone s.n. [June 21, 1879] (Ms--27819); Tuckerman & Tuckerman s.n. [19 June 1865] (Ms--50706). PENNSYLVANIA: County undetermined: E. Durand s.n. [Penna.] (Ms--30747). DELAWARE: Kent Co.: Goodale s.n. [4 July 1924] (Ms--3394). MARYLAND: Queen Annes Co.: Goodale s.n. [27 June 1927] (Ms--51036). VIRGINIA: Lee Co.: J. K. Small s.n. [July 27, 1892] (Ms--30749). Page Co.: Ahlers s.n. [Luray, June 28, '17] (Ms--53673). ILLINOIS: Cook Co.: H. H. Bab-

cock s.n. [Ruverside, June 8, 1871] (Ms--34335). Rock Island Co.:
E. A. Ross s.n. [June 1891] (Ms--111466). TENNESSEE: Blount Co.:
Curtiss 1955 (Ms--30748). MISSOURI: Saint Louis: Nickerson s.n.
 [Gray Summit, May 25, 1952] (Ms--34334). ARKANSAS: Benton Co.:
Isely 2556 (Du--340097). Clark Co.: Demaree 54128 (Ac). CULTIVA-
 TED: Germany: Herb. F. J. Young s.n. (Ws).

VERBENA SINUATA Grieve & Leyel, Modern Herb., pr. 1, 832, hyponym.
 1931.

Bibliography: Grieve & Leyel, Modern Herb., pr. 1, 832 (1931)
 and pr. 2, 832. 1959.

Nothing is known to me about this plant except what the authors
 state in their original publication (1931): "An infusion of the
 roots, taken as freely as possible, is said to be a valuable
 antisyphilitic."

VERBENA STELLARIOIDES Cham.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 1:
 Suppl. vii & 50. 1959; Moldenke, Phytologia 14: 297 (1967) and 16:
 197. 1968.

Woolston describes this plant as an herb, 30--60 cm. tall, with
 lilac-purple corollas, growing in swamps, swampy campos, or shrub-
 by campos, flowering in August. Cave (1959) reports the haploid
 chromosome number for the species as 5 and the diploid number as
 10.

Material has been misidentified and distributed in herbaria by
 Rambo, and cited by him (1965), as V. ramboi Moldenke.

Additional citations: BRAZIL: Rio Grande do Sul: O. Camargo 51
 [Herb. Anchieta 58698] (B); Rambo, Herb. Anchieta 25780 (B).
 PARAGUAY: Woolston 306 (S).

VERBENA STRICTA Vent.

Additional & emended bibliography: A. Gray, Syn. Fl. N. Am.,
 ed. 1, 2 (1): 336 (1878) and ed. 2, 2 (1): 336. 1886; S. N. F.
 Sanford, Rhodora 6: 88--89. 1904; Schaffner, Ohio Nat. 7 [Contrib.
 Bot. Lab. Ohio State Univ. 27]: 31--34. 1906; Wolden, Proc. Iowa
 Acad. Sci. 39: 122. 1934; G. E. Nichols, Ecology 15: 365. 1934;
 E. R. Spencer, Just Weeds 199, 201, 203, & 204, fog. 65. 1940;
 Chatterjee & Parks, Am. Soc. 71: 2249. 1949; Hylander, Macm. Wild
 Flow. Book 33, [331], & 340, pl. 166R. 1954; Karrer, Konstit. &
 Vork. Organ. Pflanzenst. 454 & 824. 1958; Anon., U. S. Dept. Agr.
 Bot. Subj. Index 15: 14361. 1958; Martin & Bradley, Seed Ident.
 Man. 37, fig. 236. 1961; Cave, Ind. Pl. Chromosome Numb. 2: 63 &
 81. 1961; Mohlenbrock & Voigt, Trans. Ill. Acad. Sci. 58 (4): 295.
 1965; J. E. Moore, Castanea 30: 26. 1965; Gaiser & Moore, Surv.
 Vasc. Pl. Lambton Co. 100. 1966; Wunderlin, Trans. Ill. Acad. Sci.
 59 (2): 143. 1966; Hartley, Univ. Iowa Stud. Nat. Hist. 21: 144.
 1966; Boivin, Naturaliste Can. 93: 429. 1966; Erdtman, Pollen
 Morph. & Pl. Tax. 449, fig. 256A. 1966; Shinn, Univ. Kans. Sci.
 Bull. 46: 790, 881, 886, & 887. 1967; Moldenke, Phytologia 14:
 277, 297--298, & 300. 1967; Moldenke, Résumé Suppl. 15: 1 & 2.

1967; Rickett, Wild Fls. U. S. 2 (2): 462, 464, 465, & 686, pl. 171. 1967.

Additional illustrations: E. R. Spencer, Just Weeds 204, fig. 65. 1940; Martin & Bradley, Seed Ident. Man. fig. 236. 1961; Erdtman, Pollen Morph. & Pl. Tax. 449, fig. 256A. 1966; Rickett, Wild Fls. U. S. 2 (2): pl. 171 [in color]. 1967.

Although the Wolden (1934) reference in the above supplementary bibliography appears to be dated "1932", the late Dr. J. H. Barnhart concluded that it was not actually published until 1934.

Recent collectors have found Verbena stricta growing in open disturbed areas and on rolling grassland sandhills. The Porters describe it as "common in dry gravelly soil" in South Dakota. Hartley (1966) says that it is found on "upland prairies, roadsides, railroads, pastures, and weedy borders of upland woods, scattered throughout the Driftless Area, common". The corollas are described as "purple" on C. L. Porter 7151 and as "lavender" on C. L. Porter 3413. Mohlenbrock & Voigt (1965) cite a Voigt s. n. from Illinois.

Shinn (1967) records the bee, Calliopsis (Verbenapis) verbenae, as an oligolege on this species of vervain in New Mexico. He also states that the bees, C. andreniformis and C. nebraskensis, visit these flowers.

Karrer (1958) reports the presence of "ursosure", $C_{30}H_{48}O_3$, in this plant and in such diverse species as Catalpa bignonioides, Cladonia silvatica, Crataegus oxyacantha, Cryptostegia grandiflora, Enkianthus quinqueflorus, Escallonia tortuosa, Goodenia ovata, Helichrysum italicum, Ilex latifolia, I. paraguariensis, Lavandula spica, Melissa officinalis, Nerium odorum, N. oleander, Photinia glabra, Prunus laurocerasus, Punica granatum, Salvia officinalis, Uva-ursi procumbens, Vinca minor, and Viscum album.

Cave (1961) reports the haploid chromosome number for this species as 7. Erdtman (1966) has examined the pollen of Sandberg 284 from Minnesota and describes the grains as 3-colporate, prolate spheroidal, and $35 \times 32 \mu$ in size. The seeds from which the Wagenitz collection, cited below, was grown came originally from a French garden. Nichols (1934) has shown that the seeds of this species require winter refrigeration in order to germinate.

Additional citations: MASSACHUSETTS: Hampshire Co.: Goodale s. n. [July 26, 1932] (Ms--36715, Ms--67727). PENNSYLVANIA: Lancaster Co.: A. A. Heller s. n. [September 27, 1901] (Ms--30823). ILLINOIS: Cook Co.: H. H. Babcock s. n. [Chicago, Aug. '71] (Ms--34341). La Salle Co.: Boltwood s. n. [Aug. 1881] (Ms--34340). County undetermined: Bebb s. n. [Illinois] (Ms--30817). INDIANA: Vigo Co.: A. Brown s. n. [Terre Haute, July 14/78] (Ms--30820). IOWA: Scott Co.: E. A. Ross s. n. [Davenport, July 1889] (Ms--50458). MINNESOTA: Hennepin Co.: G. B. Aiton s. n. [Aug. '89] (Ms--30819). SOUTH DAKOTA: Lawrence Co.: Porter & Porter 8359 (Du--445148). MISSOURI: Saint Louis: Eggert s. n. [DeHadamont Av.,

22 July 1875] (Ms—30818). ARKANSAS: Johnson Co.: Demaree 54242 (Ac). Searcy Co.: Demaree 22251 (Ms—50394). County undetermined: F. L. Harvey s.n. [N.W. Arkansas; Curtiss 1958] (Ms—30821). WYOMING: Albany Co.: C. L. Porter 7151 (Du—384931). Weston Co.: C. L. Porter 3413 (Du—331440). NEBRASKA: Banner Co.: Porter & Porter 8752 (Du—455934). Dawes Co.: Porter & Porter 8790 (Du—455815). OKLAHOMA: Cleveland Co.: Carr & Barkley 36316 (Rf). CULTIVATED: Germany: Herb. F. J. Young s.n. (Ws, Ws); Wagenitz s.n. [Mus. Bot. Berol. Gartenherb. W.379] (Rf).

VERBENA STRICTA f. ALBIFLORA Wadmond

Additional bibliography: Schaffner, Ohio Nat. 7 [Contrib. Bot. Lab. Ohio State Univ. 27]: 31—34. 1906; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Moldenke, Phytologia 13: 265. 1966; Boivin, Naturaliste Can. 93: 429. 1966.

Schaffner (1906) tells of seeing several thousand plants with "pinkish-white" corollas and no intermediates, covering an area of about a square mile.

Additional citations: ILLINOIS: Henderson Co.: H. N. Patterson s.n. [near Oquawka, July 1872] (Ms—30822).

VERBENA STRIGOSA Cham.

Additional bibliography: Moldenke, Phytologia 14: 298. 1967.

The Rambo, Herb. Anchieta 51940, distributed as V. strigosa, is actually V. hirta var. gracilis Dusén.

Additional citations: BRAZIL: Rio Grande do Sul: Rambo, Herb. Anchieta 49319 (B), 56628 (B).

VERBENA SUBINCANA (Troncoso) Shinnars

Additional bibliography: Shinnars, Sida 2: 442 & 448. 1966; Moldenke, Phytologia 14: 298. 1967.

VERBENA SULPHUREA D. Don

Additional synonymy: Verbena sulfurea Echeg. ex Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 68—69, in syn. 1881. Verbena sulphurea Swiet ex Lorentz & Niederlein, Bot. Exped. Rio Negro 266, sphalm. 1881.

Additional bibliography: Hieron., Bol. Acad. Nac. Cienc. Córdoba 4: [Sert. Sanjuan.] 68—69 (1881) and 4: 407. 1881; Lorentz & Niederlein, Bot. Exoed. Rio Negro 266. 1889; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 2: 895, 1161, 1178, & 1179 (1895) and pr. 2, 2: 895, 1161, 1178, & 1179. 1946; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 2: 895, 1161, 1178, & 1179. 1960; Moldenke, Phytologia 14: 282 & 298 (1967) and 16: 101. 1968.

The U. S. Dept. Agr. Bot. Subj. Index (1958) lists the Fisch. & Mey. (1840) reference cited by me in the bibliography of this species as "Fischer....Mém. Acad. Sci. St. Petersburg. s. 6, Sci. Nat. 4 (Bot.): 153—156. pl. 1845 [1840]".

Hieronymus (1881) describes two forms of this species without

special nomenclatural designation under what he calls Verbena microphylla Kunth [= V. microphylla H.B.K.]. The first of these, with slightly strigose-hispidulous foliage, he says is the same as "V. sulfurea Echeg.", while the other form, with canescent and densely strigose-hispidulous foliage, he says is the same as "V. sulfurea var. canescens Phil." It is not clear just what sort of mixup is involved here. Verbena sulphurea D. Don can hardly be confused with V. microphylla H.B.K. Possibly he refers here to V. microphylla R. A. Phil., which is actually Junellia minutifolia (R. A. Phil.) Moldenke.

Additional citations: CHILE: Valparaiso: Zöllner 1487 (Rf).

VERBENA SUPINA L.

Additional bibliography: Schnitzl., Icon. Fam. Nat. Reg. Veg. 137, fig. 2 & 4--22. 1856; Boiss., Fl. Orient. 4: 534. 1879; Covas & Hunziker, Rev. Invest. Agr. Buenos Aires 8: 251 & 253, fig. 13. 1954; Cave, Ind. Pl. Chromosome Numb. 1: Suppl. 50. 1959; Prodan & Buia, Fl. Mic. Ilus. Roman. 401 & 403, fig. 369. 1966; Moldenke, Résumé Suppl. 15: 5 & 6. 1967; Zukowski, Fl. Polska 11: 64 & 65. 1967; Hedge, Notes Roy. Bot. Gard. Edinb. 28: 81. 1967; Moldenke, Phytologia 14: 298--299 (1967) and 15: 484. 1968.

Additional illustrations: Schnitzl., Icon. Fam. Nat. Reg. Veg. 137, fig. 2 & 4--22 [in color]. 1856; Covas & Hunziker, Rev. Invest. Agr. Buenos Aires 8: 253, fig. 13. 1954; Prodan & Buia, Fl. Mic. Ilus. Roman. fig. 369. 1966.

Dr. I. L. Wiggins, in a letter to me dated March 16, 1967, states that the specimens cited below in the Dudley Herbarium all look to him as though the plant was prostrate "with a part of a prostrate or sub-prostrate branch.....cut or broken from the plant, and erect branches springing from it." Until more is known about the habit of this species, I am leaving these specimens here.

The Boissier (1879) reference in the bibliography given above is sometimes cited as "1875", but the page involved actually was not issued until 1879.

Hedge (1967) describes a specimen of this species collected by Paul Dietrich Giseke, now deposited in the herbarium of the Royal Botanic Garden at Edinburgh, dated between 1776 and 1779 and inscribed "ex H.E.U." -- it is assumed that this specimen was sent to Edinburgh by Adolf Murray and that it was collected in the Hortus Botanicus Upsaliensis, which was Linnaeus' garden at Uppsala, Sweden.

Cave (1959) reports the diploid chromosome number for this species as 14.

Emended citations: TUNISIA: Kralik 321, in part (Du--448692). EGYPT: A. Wiest 90 [Herb. Prager 18642], in part (Du--448691). SUDAN: Nubia: Kotschy 323, in part (Du--166451). JORDAN: Field & Lazar 190, in part (Du--235839).

VERBENA SUPINA f. ERECTA Moldenke

Additional bibliography: Moldenke, Phytologia 14: 299. 1967.

Dr. I. L. Wiggins, in a letter dated March 16, 1967, tells me that the specimens of Kralik 321, A. Wiest 90, Kotschy 323, and Field & Lazar 190 in the Dudley Herbarium appear to him as though the main stems of the plant were definitely prostrate or sub-prostrate, with erect branches springing from them. The species obviously needs more study in the field to determine if this so-called erect form is actually a valid one.

Additional citations: SPAIN: Herb. F. J. Young s.n. (Ws).

VERBENA TAMPENSIS Small

Additional bibliography: Moldenke, Phytologia 11: 481. 1965; Rickett, Wild Fls. U. S. 2 (2): 462 & 686. 1967.

Lakela found this plant growing in disturbed open pineland with secondary longleaf pine, sabal palmetto and saw palmetto, Myrica, Lyonia, and Befaria, and describes it as having "branches profuse from the crown, decumbent". The corollas are said to have been "rose-purple" on Lakela 24997.

Additional citations: FLORIDA: Brevard Co.: Curtiss 1963 (Ms--30753). Hillsborough Co.: Lakela 24997 (Du--504244).

xVERBENA TEASII Moldenke

Additional bibliography: L. H. Bailey, Man. Cult. Pl., ed. 2, 840, 841, & 1113. 1949; Moldenke, Phytologia 11: 481. 1965.

VERBENA TENERA Spreng.

Additional bibliography: H. Fischer, Beitr. Vergl. Morphol. Pollenk. 46--47. 1890; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 1, 628, 629, & 849 (1924) and pr. 2, 628, 629, & 849. 1925; Bonstedt, Pareys Blumengärtn., ed. 1, 274. 1932; L. H. Bailey, Man. Cult. Pl., ed. 1, pr. 3, 628, 629, & 849 (1938), pr. 4, 628, 629, & 849 (1944), and ed. 2, 840, 841, & 1113. 1949; Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 442. 1960; Deb, Bull. Bot. Surv. India 3: 315. 1961; Moldenke, Résumé Suppl. 15: 24. 1967; J. F. Williamson, Sunset West. Gard. Book, new ed., 437. 1967; Moldenke, Phytologia 14: 299 (1967) and 16: 96 & 201. 1968.

Bonstedt (1932) places V. pulchella Sweet and V. multifida Hort. in the synonymy of V. tenera, but I regard the former as a valid species and the latter as a synonym of V. laciniata (L.) Briq. He records the German common name, "zartes Eisenkraut". It is perhaps worth quoting here the complete description of this taxon as given by Maatsch (1960) to illustrate the horticulturists' concept of the species: "V. tenera Spreng. Brasilien, Uruguay, Argentinien. Sommer bis Herbst. Staudig-halbstrauchig, meist einjährig kultiviert, 15--30 cm hoch, sehr ästig, kriechend, mit niedergestreckten, wurzelschlagenden, dann aufstrebenden, leich behaarten Stengeln. Blätter gegenständig, tief-, meist fiederförmig-eingeschnitten, mit linealischen, spitzlichen, meist ganzrandigen, am Rande fast umgebogenen, zerstreut-striegelhaarigen Lappen. Blüten in einzelnen oder dreizähligen, anfangs dichten und doldenförmigen,

während der Blütezeit sich verlängernden Ähren, violettrosa. — 1832. Eine italienische Sorte ist CV. 'Maonettii'; ihre Blätter sind breiter, die Kronröhre ist fast doppelt so lang wie der Kelch, an der Einfüguugsstelle der Staubblätter gebärtet, sonst aber kahl. Kronabschnitte keilförmig-verkehrt-herzförmig. Deckblätter lanzettlich, zugespitzt, halb so lang wie der behaarte Kelch. Blüten lebhaft karmesin-violettrot, mit ausgeprägtem, weissem Rande. Diese Sorte wird auch als Hybride zwischen V. tenera x V. incisa angesehen. Sie ist die Stammform der sogenannten 'Italienischen Verbenen', die durch auf weissem Grunde rot-, rosa-, blau- oder lilagestreifte Blüten gekennzeichnet sind. Sie spielen im heutigen Sortiment keine Rolle mehr. (K) V. tenera ist, abgesehen von V. rigida, härter als die übrigen Arten und gut für Einfassungen und bunte Pflanzungen geeignet. Da die kriechenden Stengel bald wurzeln und sich ausbreiten, kann diese Art und ihre Sorten auch für grössere Flächen oder Unterpflanzungen, z.B. von Gladiolen, verwendet werden. Anzucht aus Samen in März, wie vorige. Vermehrung auch durch Stecklinge oder Ableger."

Deb records V. tenera from cultivation in Manipur, India, but I strongly suspect that the plant he refers to is V. tenuisecta. Briq.

The Spies s.n., Pivetta 1155, and Herb. Anchieta 61292 & 63244, distributed as V. tenera, are actually V. tenuisecta Briq., while the O. Camargo 2022 [Herb. Anchieta 62124], cited by me as V. tenera in a previous publication, proves to be V. selloi Spreng.

Additional citations: BRAZIL: Paraná: Hatschbach 14968 (Ac), 14984 (Rf).

VERBENA TENERA var. MAONETTI Regel

Additional synonymy: Verbena mahonetii Hort. ex Bonstedt, Pareys Blumengärtn., ed. 1, 2: 274, in syn. 1932. Verbena tenera x incisa Bonstedt, Pareys Blumengärtn., ed. 1, 2: 274. 1932.

Verbena tenera var. maonettii Regel ex L. H. Bailey, Man. Cult. Pl., ed. 2, 841. 1949. Verbena tenera cv. "Maonettii" Maatsch in Encke, Pareys Blumengärtn., ed. 2, 442. 1960.

Additional bibliography: Bonstedt, Pareys Blumengärtn., ed. 1, 2: 274. 1932; L. H. Bailey, Man. Cult. Pl., ed. 2, 841 & 1113. 1949; Maatsch in Encke, Pareys Blumengärtn., ed. 2, 2: 442. 1960; Moldenke, Phytologia 11: 481. 1965; Moldenke, Résumé Suppl. 15: 24. 1967; J. F. Williamson, Sunset West. Gard. Book, new ed., 437. 1967.

Williamson (1967) describes this plant as creeping, with flat clusters of pink flowers with white margins. A German common name for plants of this variety is "italienischen Verbenen".

VERBENA TENUISECTA Briq.

Additional bibliography: L. H. Bailey, Man. Cult. Pl., ed. 2, 840, 841, & 1113. 1949; Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Deb, Bull. Bot. Surv. India 3: 315. 1961; Maheshwari, Fl.

Delhi 278--279. 1963; Sharp & Baker, Castanea 29: 183. 1964; Batson, Wild Fls. S. C. 99. 1964; Teague, Anal. Mus. Host. Nat. Montev., ser. 2, 7 (4): 44. 1965; Jiménez, Supl. Cat. Fl. Doming. 1: 221. 1966; R. H. Compton, Journ. S. Afr. Bot. Suppl. 6: 65 & 157. 1966; Solbrig, Biol. Abstr. 47: 2870. 1966; Twisselmann, Wasmann Journ. Biol. 25: 327. 1967; Moldenke, Résumé Suppl. 15: 1, 2, 7, & 15. 1967; Rickett, Wild Fls. U. S. 2 (2): 462, 463, & 686, pl. 170. 1967; Shinn, Univ. Kans. Sci. Bull. 46: 886. 1967; Moldenke, Phytologia 14: 287 & 299 (1967), 15: 486 & 493 (1968), and 16: 51, 185, 188, 199, & 208. 1968.

Additional illustrations: Batson, Wild Fls. S. C. 99 [in color]. 1964; Rickett, Wild Fls. U. S. 2 (2): pl. 170 [in color]. 1967.

The Porters describe this plant as common in "open weedy areas in sandy soil" in Taylor County, Florida, having the "stems prostrate and rooting". Teague (1965) refers to it as a ruderal weed, spreading to crops, used as a diuretic and laxative in medicine. Compton (1966) records this species from Swaziland. Cave (1961) reports the diploid chromosome number as 10.

The corollas are described as "pinkish-lavender" on Porter & Porter 8913. Those on Demaree 49561 have the appearance, when dried, as though they might have been white when fresh, although the collector does not state this fact on the label. The Andrew Moldenkes report, and illustrate by means of kodachrome photographs of the plants in situ, that their no. 2033 represents plants with mostly normal-colored corollas growing with some that had pink and some others that had white corollas.

Sharp & Baker (1964) report the species from Henderson County, Tennessee, on the basis of a specimen in the herbarium of the University of Tennessee.

The "Verbena bipinnatifida Nutt." and "Verbena bipinnatifida Schau." recorded by various recent Indian authors, including Maheshwari (1963), appear to be based on misidentifications. The plant to which they refer and which they in some cases describe is most certainly V. tenuisecta. The description given by Maheshwari, for instance, is: "Prostrate perennials; leaves dissected into linear segments; flowers lilac-purple, in dense heads elongating in fruits.... A prostrate, hirsute, perennial herb with ascending stems. Leaves divided into linear divisions, long-petiolate. Flowers lilac-purple, in dense heads elongating in fruits. Bracts equalling the sepals. Calyx lobes setaceous. Cultivated in garden beds and along slopes of private roads, forming a thick carpet and beautifying the landscape; often met as an escape in waste places near gardens. Flowers and Fruits: Winter season." He cites Maheshwari 241.

Twisselmann (1967) records the species from Kern County, California, and says "occasional escape in vacant lots, waste places, about Bakersfield -- at the Antelope Ranch grounds."

Deb (1961) records V. tenera Spreng. as cultivated in gardens in Manipur, India, represented by his no. 198, but I suspect that his plant will probably prove to be V. tenuisecta.

Shinn (1967) reports that he has observed only the males of the

bee, Calliopsis (Verbenaxis) andreniformis, visiting the flowers of this vervain at Nacogdoches, Texas.

Material of V. tenuisecta has been misidentified and distributed in herbaria under the names V. drummondii Bxt. and V. venosa Gill. & Hook.

Additional citations: GEORGIA: Brooks Co.: Demaree 52786a (Ms-50395). Colquitt Co.: Demaree 48535 (Ms--50396). Effingham Co.: R. S. Wisner s.n. [Sept. 5, 1934] (Ms--78857). Sumter Co.: Demaree 49561 (Ms--50397). Ware Co.: Kuns 224 (Ws), 300 (Ws). FLORIDA: Gadsden Co.: Goodale s.n. [20 March 1933] (Ms--69848). Taylor Co.: Porter & Porter 8913 (Du--491207). LOUISIANA: Orleans Par.: Ewan 18008 (Rf). Sabine Par.: Ewan 21148 (Ac). TEXAS: Harris Co.: Nickerson s.n. [April 10, 1950] (Ms--34284). ARIZONA: Cochise Co.: Moldenke & Moldenke 2033 (Rf, Z--photo, Z--photo). BRAZIL: Paraná: Hatschbach 15051 (Ac). Rio Grande do Sul: Pivetta 1155 [Herb. Anchieta 61292] (B); Rambo, Herb. Anchieta 51652 (B); Spies s.n. [Herb. Anchieta 63244] (B). ARGENTINA: Formosa: Krapovickas 13080 (Rf). Misiones: G. J. Schwarz 2260 (Ms--34344). CULTIVATED: India: Pratibha s.n. (Ws). New York: H. N. Moldenke 24324 (Ac). Paraguay: G. W. Teague 44 (Ws).

VERBENA TENUISECTA var. ALBA Moldenke

Additional bibliography: L. H. Bailey, Man. Cult. Pl., ed. 2, 841 & 1113. 1949; Moldenke, Phytologia 13: 273. 1966.

As mentioned above, the Andrew Moldenkes report, and illustrate by means of kodachrome photographs of the plants in situ, that their collection no. 2033 represents not only plants with normal-colored corollas, but also some with pink- and some with white-colored corollas, growing in Cochise County, Arizona. The pink form does not yet have nomenclatural designation, but appears to be worthy of it. I hereby designate it VERBENA TENUISECTA f. RUBELLIA Moldenke, f. nov. Haec forma a forma typica speciei corollis rubellis recedit.

VERBENA TENUISPICATA Stapf, Denkschr. Math.-nat. Class. K. Akad.

Wiss. Wien 50 [Bot. Ergebn. Polak. Exped. 1]: 34--35. 1885.

Synonymy: Verbena officinalis var. tenuiscapa Stapf ex Borm., Beih. Bot. Centralbl. 22 (2): 117. 1907.

Additional & emended bibliography: Stapf, Denkschr. Math.-nat. Class. K. Akad. Wiss. Wien 50 [Bot. Ergebn. Polak. Exped. 1]: 34--35. 1885; Borm., Beih. Bot. Centralbl. 22 (2): 117. 1907; Moldenke, Phytologia 11: 304. 1965; Moldenke, Résumé Suppl. 15: 24. 1967.

VERBENA TEUCRIIFOLIA Mart. & Gal.

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Moldenke, Phytologia 14: 299--300. 1967.

The corollas on H. E. Moore 3122 are described as "magenta" and the plant was found growing in fir forests. My son, Andrew R.

Moldenke, informs me that the corollas on his collection number 1756 were "light-magenta" in color and that this collection is representative of hundreds of plants that were growing in close proximity to equally large colonies of plants with "dark-magenta" corollas, represented by his number 1757. He states that the colonies were very distinct in the field, with no intermediates. He also states that the plants represented by his number 1756, 1757, & 1765 were completely prostrate, even the inflorescences were prostrate, with the foliage closely appressed to the ground or rock. His number 1780, on the other hand, represents plants with erect stems and inflorescences and an entirely different aspect in the field. It is very possible that several taxa are represented here.

Cave (1961) reports the haploid chromosome number for this species as 15.

Additional citations: MEXICO: Hidalgo: H. E. Moore 3122 (Ws). Michoacán: A. R. Moldenke 1756 (Rf), 1757 (Rf), 1765 (Ac), 1780 (Ac). Veracruz: Beaman 2191 (Ws); Moldenke & Moldenke s.n. [border of Veracruz & Puebla on Rt. No. 140, Aug. 1, 1967] (Z--photo).

VERBENA THYMOIDES Cham.

Additional bibliography: Moldenke, *Phytologia* 14: 300. 1967.

Additional citations: BRAZIL: Rio Grande do Sul: O. Camargo 105 [Herb. Anchieta 58767] (B), 216 [Herb. Anchieta 58730] (B); Rambo, Herb. Anchieta 48873 (B).

VERBENA TOWNSENDII Svenson

Additional bibliography: Moldenke, *Phytologia* 11: 316--317. 1965.

The A. Stewart 3317 referred to V. glabrata H.B.K. on page 317 of the reference given above is actually the type collection of V. glabrata var. temuispicata Moldenke.

VERBENA TRIFIDA H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: 221, pl. 134. 1817.

Additional & emended bibliography: H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: 221, pl. 134 (1817), ed. quart., 2: pl. 134 (1817), and ed. quart., 2: 273. 1818; Barnhart, *Bull. Torrey Bot. Club* 29: 590. 1902; Moldenke, *Phytologia* 14: 300. 1967.

Additional & emended illustrations: H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: pl. 134 [in color] (1817) and ed. quart., 2: pl. 134. 1817.

It should be noted here that the H.B.K. reference dates given above have been authenticated by consultation of the work by Barnhart (1902).

xVERBENA TRINITENSIS Moldenke

Additional bibliography: Moldenke, *Phytologia* 11: 481 (1965) and 16: 185 & 188. 1968.

Comments recently made by Krapovickas seem to indicate that this

hybrid may be identical with V. calliantha Briq. At least, he feels that his collection number 13085 [cited by me as V. calliantha Briq.] is a natural hybrid between his number 13087 [which is V. incisa Hook., but which he regarded as Glandularia peruviana] and his number 13080 [cited by me as V. tenuisecta Briq.]

VERBENA TRISTACHYA Troncoso & Burkart

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14361. 1958; Cave, Ind. Pl. Chromosome Numb. 1: Suppl. vii & 50. 1959; Moldenke, Phytologia 11: 321—324. 1965.

Cave (1959) reports the haploid chromosome number for this species as 5.

VERBENA URTICIFOLIA L.

Additional synonymy: Verbena urticifolia Willd. ex Moldenke, Résumé Suppl. 15: 24, in syn. 1967. Verbena urticaefolia A. Gray, in herb.

Additional & amended bibliography: Robin, Fl. Louis. 385. 1807; Raf., Fl. Ludovic., pr. 1, 39. 1817; A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 335. 1878; Fowler, Rep. Sec. Agr. N. Bruns. 1879, App. 5. 1880; G. U. Hay, Bull. Nat. Hist. Soc. N. Bruns. 2: 30. 1883; J. Macoun, Cat. Can. Pl. 378—379. 1884; Fowler, Bull. Nat. Hist. Soc. N. Bruns. 4: 50. 1885; A. Gray, Syn. Fl. N. Am., ed. 2, 2 (1): 335. 1886; A. S. Hitchc., Ann. Rep. Mo. Bot. Gard. 4: 117. 1893; H. Fischer, Beitr. Vergl. Morphol. Pollenk. 46. 1890; Grieve & Leyel, Modern Herb., pr. 1, 2: 832. 1931; Wolden, Proc. Iowa Acad. Sci. 39: 122. 1934; Rendle, Notes Fl. Bermuda 9. 1937; E. R. Spencer, Just Weeds 199—201 & 204, fig. 64. 1940; L. J. Bradley, Ferns & Flow. Pl. Audubon Cent. 67. 1955; Grieve & Leyel, Modern Herb., pr. 2, 2: 832. 1959; Cave, Ind. Pl. Chromosome Numb. 2: 63, 81, & 137. 1961; H. L. Hoffman, Castanea 29: 31. 1964; Marie-Victorin, Fl. Laurent., ed. 2, 489 & 490, fig. 170. 1964; Rodgers & Shake, Castanea 30: 163. 1965; Mohlenbrock & Voigt, Trans. Ill. Acad. Sci. 58 (4): 295. 1965; Reese & Thieret, Castanea 31: 274. 1966; Gaiser & Moore, Surv. Vasc. Pl. Lambton Co. 100. 1966; Wunderlin, Trans. Ill. Acad. Sci. 59 (2): 143. 1966; Hartley, Univ. Iowa Stud. Nat. Hist. 21: 144. 1966; Boivin, Naturaliste Can. 93: 429. 1966; Silberhorn, Castanea 31: 293. 1966; Shinn, Univ. Kans. Sci. Bull. 46: 790, 886, 887, & 928. 1967; Cody, Ind. Sem. 1967: 18. 1967; Rickett, Wild Fls. U. S. 2 (2): 462, 464, & 686, pl. 173. 1967; Raf., Fl. Ludovic., pr. 2, 39. 1967; Fulling, Ind. Bot. Record. Bot. Review 563. 1967; Moldenke, Résumé Suppl. 15: 1, 2, & 24. 1967; Davidson & Buell, Am. Midl. Nat. 77: 381. 1967; Zukowski, Fl. Polska 11: 65. 1967; Moldenke, Phytologia 14: 277, 298, & 300—301 (1967) and 16: 52, 90, 185, & 192. 1968.

Additional illustrations: E. R. Spencer, Just Weeds 200, fig. 64. 1940; Marie-Victorin, Fl. Laurent., ed. 2, fig. 170. 1964; Rickett, Wild Fls. U. S. 2 (2): pl. 173 [in color]. 1967.

Although the Wolden reference in the bibliography above (1934) is dated "1932", the late Dr. J. H. Barnhart concluded that it was not actually published until 1934.

Recent collectors report finding this plant growing on moist banks and in rich woods. Rodgers & Shake (1965) report it from Transylvania County, North Carolina, and from Oconee County, South Carolina. Reese & Thieret (1966) record it from the Five Islands of Louisiana, while Silberhorn (1966) found it growing in the ruins of an old saw mill in Monongalia County, West Virginia. Wunderlin (1966) records it from Carroll County, Illinois. Hartley (1966) tells us that it is to be found in "roadsides, low pastures, and stream banks, common in [the] Driftless Area except in [the] northeastern counties". Mohlenbrock & Voigt (1965) cite a Stieglitz s.n. from Illinois. Boivin (1966) records it from New Brunswick and Saskatchewan. Fowler (1880, 1885) cites a Hay s.n. and a Moser s.n. from Keswick Ridge and a Hay s.n. from Eel River, York County, New Brunswick. Hay (1883) also speaks of the Eel River station. Macoun (1884) says that the species grows in "Waste places, roadsides, and old pastures, appearing as if introduced but certainly indigenous. Keswick Ridge, N. B. (Moser.) St. Remi, Q. (McGill Coll. Herb.) Roadside, Côté St. Antoine, and other localities near Montreal, 1821. (Holmes.) Valley of the St. Charles, near Quebec. (Thomas). Not uncommon in Ontario extending west to Owen Sound." Zukowski (1967) states that it is both cultivated and escaped in Poland.

Dr. Boivin, in a letter to me dated May 1, 1967, says "To my knowledge there are specimens of Verbena urticifolia from New Brunswick in only four collections. None at the Gray, New York, University of Montreal, National Herbarium of Canada, etc. Records are: Narrows Dam, Victoria co. (DAO, UNB) and Keswick, York co. (DAO, AFES)." The herbaria to which he refers are the Phanerogamic Herbarium, Plant Research Institute, Ottawa, the University of New Brunswick, and the Forest Research Branch, Department of Forestry, Fredericton, New Brunswick.

Shinn (1967) observed the females of the bees, Calliopsis (Verbenapis) andreniformis and C. nebraskensis, gathering pollen from the flowers of this vervain. It should be noted here that the alternate generic name for this group of insects was inadvertently misspelled by me in Phytologia 14: 300 (1967).

Spencer (1940) states that the woody stems of this plant are used as arrows by country boys and to make brushes for fighting bumblebees. Cave (1961) reports the haploid chromosome number for the species as 7 and the diploid number as 14.

Material has been misidentified and distributed in herbaria as xV. engelmannii Moldenke.

Additional citations: VERMONT: Rutland Co.: Goodale s.n. [6 Aug. 1926] (Ms--48537). MASSACHUSETTS: Franklin Co.: W. D. Forbes 143 (Ms--72676); Goodale & Markert s.n. [11 Aug. 1932] (Ms--67705); Goodale, Markert, & Piper s.n. [7 Aug. 1929] (Ms--55642). Hampden Co.: Clark & Seymour G.682 (Ms--71570); Dorwart s.n. [18 July 1932] (Ms--68338); Goodale & Markert s.n. [25 July 1930] (Ms--59638). Hampshire Co.: Elwell s.n. [July 16, 1889] (Ms--50455); Goodale s.

n. [27 July 1927] (Ms--51798), s.n. [3 Aug. 1933] (Ms--70884); Goodale, Potsubay, & St. John s.n. [22 July 1931] (Ms--64868), s. n. [13 August 1931] (Ms--64865); Herb. Amherst Coll. s.n. (Ms--45386, Ms--45390); Pease 20359 (Ms--54509); F. R. Saint John s.n. [11 Sept. 1930] (Ms--59636). Worcester Co.: Goodale & Markert s. n. [12 Aug. 1930] (Ms--59639); Goodale, Markert, & Piper s.n. [26 July 1929] (Ms--55643), s.n. [24 Aug. 1929] (Ms--55641); Goodale, Potsubay, & St. John s.n. [31 July 1931] (Ms--64866), s. n. [3 Aug. 1931] (Ms--64867); Potsubay s.n. [26 June 1930] (Ms--59637). CONNECTICUT: Hartford Co.: Ahles 65310 (Ms--51738). New Haven Co.: C. H. K. Sanderson 1957 (Ms--72455). NEW YORK: Bronx Co.: A. Brown s.n. [July 31, '75] (Ms--30826). Dutchess Co.: Ahles 53066 (Ms--50540); Poppey s.n. [Aug. 5th, '74] (Ms--58351). Nassau Co.: M. Hopkins s.n. [22 Aug. 1929] (Ms--57730), s.n. [7 Aug. 1930] (Ms--59626). Saratoga Co.: P. Potter s.n. [Aug. 30, 1932] (Ms--69320). PENNSYLVANIA: Philadelphia Co.: E. Durand s. n. [near Philad.] (Ms--30825). OHIO: Butler Co.: T. J. Cobbs 144 (Du--447704). ILLINOIS: Tazewell Co.: V. H. Chase 3228 (Du--367443). ARKANSAS: Cross Co.: Demaree 19633 (Ms--50424). LOUISIANA: Saint Landry Par.: Ewan 19328 (Rf). Saint Tammany Par.: Ewan 17791 (Ac, Rf). CULTIVATED: Germany: Herb. F. J. Young s.n. (Ws); Wagenitz s.n. [Mus. Bot. Berol. Gartenherb. W.378] (Rf).

VERBENA URTICIFOLIA var. LEIOCARPA Perry & Fernald

Additional bibliography: Moldenke, *Phytologia* 14: 301. 1967; Moldenke, *Résumé Suppl.* 15: 1. 1967.

xVERBENA VAGA Moldenke

Additional bibliography: Moldenke, *Phytologia* 14: 301. 1967.

Illustrations: Schnack & Gonzalez, *Revis. Argent. Agronom.* 12: 286, 287, & 289, fig. 1B, D, & E, & 3, pl. 15 A, B, & C. 1945.

VERBENA VALERIANOIDES H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: 224. 1817 [not V. valerianoides St.-Hil., 1947].

Additional & emended bibliography: H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: 224 (1817) and ed. quart., 2: 277. 1818; Barnhart, *Bull. Torrey Bot. Club* 29: 590. 1902; Moldenke, *Phytologia* 14: 301. 1967.

It should be noted here that the H.B.K. reference dates given above have been authenticated by consultation with the work of Barnhart (1902).

VERBENA WRIGHTII A. Gray

Additional & emended bibliography: A. Gray, *Syn. Fl. N. Am.*, ed. 1, 2 (1): 337--338 (1878) and ed. 2, 2 (1): 337--338. 1886; Cave, *Ind. Pl. Chromosome Numb.* 2: 137. 1961; Solbrig, *Madroño* 16: 267. 1962; Cave, *Ind. Pl. Chromosome Numb.* 2: 216. 1963;

Moldenke, Phytologia 14: 301 (1967), 15: 485 & 486 (1968), and 16: 48 & 54. 1968.

The Porters have found this species growing in dry clayey deserts with Covillea and Lepidium and report it as "common along roadsides on the plains" in San Miguel County, New Mexico. Cave (1961, 1963) reports the haploid chromosome number for this species as 10 and the diploid number as 20.

The L. Benson 8821, distributed as V. wrightii, is actually V. bipinnatifida Nutt., while N. H. Russell 11233 is V. gooddingii Briq. and the Wooton 642, distributed as "Verbena bipinnatifida x wrightii ?" is V. ambrosifolia Rydb. The Wooton & Standley s.n. [Aug. 25, 1907] specimen, cited below, was apparently originally distributed with a label reading "3635", but that number was later crossed out in ink.

Additional citations: COLORADO: El Paso Co.: Kraus s.n. [June 22, 1926] (Ws). TEXAS: Brewster Co.: McKetchnie 441 (Ws); R. Mc Vaugh 7868 (Du--366742). Culberson Co.: Hitchcock & Stanford 6782 (Du--352758). Jeff Davis Co.: Tharp 51-22 (Ms--34250); Tharp & Janszen 49-1140 (Ms--34251). Reeves Co.: Nelson & Nelson 4983 (Du--331413), 5014 (Du--331414). NEW MEXICO: Dona Ana Co.: Wooton s.n. [1900; Herb. Field Mus. 25638] (Ws), s.n. [May 26, 1905; Herb. Field Mus. 25537] (Ws). Eddy Co.: Porter & Porter 8978 (Du--491335). Grant Co.: O. B. Metcalfe 126 (Ms--30829). Lincoln Co.: Wooton & Standley s.n. [Aug. 25, 1907; Herb. Field Mus. 27453] (Ws). San Miguel Co.: C. L. Porter 3016 (Du--328695). Santa Fe Co.: Heller & Heller 3536 (Ms--30760). Sierra Co.: O. B. Metcalfe 1090 (Ms--30752).

VERBENA XUTHA Lehm.

Additional & emended bibliography: A. Gray, Syn. Fl. N. Am., ed. 1, 2 (1): 335 (1878) and ed. 2, 2 (1): 335. 1886; Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Reese & Thieret, Castanea 31: 274. 1966; Moldenke, Phytologia 13: 276. 1966; Moldenke, Résumé Suppl. 15: 2. 1967; Rickett, Wild Fls. U. S. 2 (2): 464, 465, & 686, pl. 171. 1967.

Additional illustrations: Rickett, Wild Fls. U. S. 2 (2): pl. 171 [in color]. 1967.

Demaree refers to this plant as "common in chalk area" in Arkansas. Reese & Thieret (1966) record the species from the Five Islands of Louisiana. Cave (1961) reports the haploid chromosome number for the species as 21.

The M. E. Jones 28296, distributed as V. xutha, is actually V. canescens var. roemeriana (Scheele) Perry.

Additional citations: ARKANSAS: Little River Co.: Demaree 54082 (Rf), 54085a (Ac). LOUISIANA: Saint Tammany Par.: Ewan 20208 (Ac). Vermillion Par.: Ewan 21369 (Rf). TEXAS: Harris Co.: G. L. Fisher s.n. [June 9, 1912] (Ws), s.n. [May 18, 1914] (Ws).

ADDITIONAL MATERIALS TOWARD A MONOGRAPH OF THE GENUS
CALLICARPA. VIII

Harold N. Moldenke

CALLICARPA L.

Additional & emended synonymy: Tomex L., Nov. Pl. Gen. Diss. Dassow 5. 1747 [not Tomex Forsk., 1775, nor Thunb., 1783]. Johnsonia T. Dale ex P. Mill., Gard. Dict., ed. 6, app. 75 (1752) and ed. 7. 1759 [not Johnsonia Adans., 1763, nor R. Br., 1810, nor Neck., 1790]. Burcardia Heist. ex Duham., Trait. Arb. & Arbust. 1: 111--112, pl. 44. 1755 [not Burcardia Raf., 1838, nor Schreb., 1789]. Burchardia Duham. apud L., Sp. Pl., ed. 2, 1: 161, in syn. 1762 [not Burchardia Auct., 1966, nor R. Br., 1810, nor Neck., 1790]. Frutex Catesb. apud Adans., Fam. Pl. 2 (2): 226, in syn. 1763. Spondylococcus Mitch. apud Reichenb. in Mössler, Handb. Gewächsk., ed. 1, 1: xxxvi. 1827 [not Spondylococcus Reichenb., 1828]. Burchardia [Heist.] Duham. apud Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 361, in syn. 1893. Burchardia B. D. Jacks. apud Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 166, in syn. 1966. Johnsonia "T. Dale ex Mill." apud Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 590, in syn. 1966. Sphondylococcum Schau. ex Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 1059, in syn. 1966. Calycarpon A. Br., in herb.

Additional & emended bibliography: Mitch., Diss. Bot. & Zool. 40. 1769; Robin, Fl. Louis. 384. 1807; Raf., Fl. Ludovic., pr. 1, 38--39 & [125]. 1817; H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 204--205 (1817) and ed. quart., 2: 252--253. 1818; Schnitzl., Icon. Fam. Nat. Reg. Veg. 137. 1856; Watt, Econ. Prod. India 5: 68 (1883), 6: 40 (1883), and 7: 54. 1883; Maxim., Bull. Acad. Imp. Sci. St. Pétersb. 31: 75--80. 1886; Meehan, Meehan's Monthly 11: 129--130, pl. 9. 1901; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Prain, Beng. Fl., ed. 1, 2: 823 & 827. 1903; Beissner, Schelle, & Zabel, Handb. Laubh. 425. 1903; Millsp. in Fedde, Repeet. Spec. Nov. 7: 285. 1909; Duthia, Fl. Upper Gang. Plain 2: 215 & 218--219. 1911; Craib, Contrib. Fl. Siam Dicot. 163. 1912; A. Chev., Cat. Pl. Jard. Bot. Saigon 35. 1919; Haines, Bot. Bihar & Orissa 4: 704 & 709--710. 1922; W. J. Bean, Garden 88: 184. 1924; Gamble, Fl. Presid. Madras 6: 1085 & 1091--1092. 1924; Nakai, Bot. Mag. Tokyo 40: 491--492. 1926; T. Itô, Taiwan Shokubutsu Dzusetsu [Illustr. Formos. Pl.] 7, pl. 601--606. 1927; Nakai in Nakai & Koidz., Trees & Shrubs Indig. Jap., ed. 2, 1: 450--464, fig. 213--219. 1927; P. Dop, Trav. Lab. For. Toulouse 1 [Art. Divers. 1] (21): 5--21. 1932; Bonstedt, Pareys Blumengärtn., ed. 1, 272. 1932; Schelle, Pareys Blumengärtn., ed. 1, 278. 1932; P'ei, Sinensia 2: [65]--68. 1932; Masam. & Suzuki, Ann. Rep. Taih. Bot. Gard. 3: 66. 1933; Chun, Sunyat. 1: 302--303. 1934; Hosokawa,

- Journ. Soc. Trop. Agr. Taiwan 6: 205--206. 1934; K. Mori in Masum., Short Fl. Formos. 179. 1936; Terazaki, Suppl. Illustr. Fl. Jap., fig. 2484--2488. 1938; Rendle, Notes Fl. Bermuda 18. 1937; E. S. & F. E. Clements, Natl. Geogr. Mag. 76: 240. 1939; Biswas, Indian Forest Rec. Bot. 3: 41. 1941; Plouvier, Compt. Rend. Acad. Sci. Paris 231: 1546--1548. 1950; Li & Keng, Taiwania 1 (2-4): 127. 1950; V. S. Rao, Journ. Indian Bot. Soc. 31: [297], 304--[305], 312, & 313, fig. 33--35. 1952; Hylander, Macm. Wild Flow. Book 337 & 340. 1954; Lee & Keng, Taiwania 1 (5): 5 & 7. 1954; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14354. 1958; Hara, Distrib. Maps Flow. Pl. Japan 51. 1958; Potztal in Encke, Pareys Blumen-gärtn., ed. 2, 2: 439. 1960; Krüssmann in Encke, Pareys Blumen-gärtn., ed. 2, 2: 445--446. 1960; Kitamura & Okamoto, Col. Illust. Trees & Shrubs Japan 219--220, pl. 65. 1960; Martin & Bradley, Seed Ident. Man. 115 & 195, fig. 261 & 792. 1961; W. H. Lewis, Southwest. Nat. 6: 45--48, fig. 1. 1961; Cave, Ind. Pl. Chromosome Numb. 2: 136 & 155. 1961; Panigrahi & Naik, Bull. Bot. Surv. India 3: 376--377. 1961; Deb, Bull. Bot. Surv. India 3: 314. 1961; M. A. Rau, Bull. Bot. Surv. India 3: 238. 1961; Thothathri, Bull. Bot. Surv. India 4: 295. 1962; H. F. MacMillan, Trop. Plant. & Gard., ed. 5, 104. 1962; Maheshwari, Fl. Delhi 280--281. 1963; Prain, Beng. Pl., ed. 2, 2: 617--618. 1963; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 184, 213, 394, 501, 513, 542, & 558. 1963; Bhatnagar, Journ. Indian Bot. Soc. 42: 369 & 374. 1963; Batson, Wild Fls. S. C. 100. 1964; Cave, Ind. Pl. Chromosome Numb. 2: 330. 1964; Chuang, Chao, Hu, & Kwan, Taiwania 1 (8): 54, 58, 59, 63, & 66, pl. 3, fig. 39, & pl. 6, fig. 88. 1963; Arora, Journ. Indian Bot. Soc. 43: 81 & 82. 1964; Dakshini, Journ. Indian Bot. Soc. 44: 418 & 410. 1965; P. K. K. Nair, Pollen Gr. West. Himal. Pl. 35 & 89, pl. 12, fig. 154. 1965; R. E. & C. R. Harrison, Know Your Trees 39. 1965; Chopra, Badhwar, & Ghosh, Poison. Pl. India 2: 695--696, fig. 175. 1965; Maheshwari & Singh, Dict. Econ. Pl. India 30. 1965; Bose, Handb. Shrubs 17, 34, & 104. 1965; S. A. Manning, Syst. Guide Flow. Pl. 18 & 142. 1965; F. A. Barkley, List Ord. Fam. Anthoph. 76, 147, 148, 176, & 200. 1965; Ohwi, Fl. Jap. 763--764. 1965; Datta, Handb. Syst. Bot. 181, 183, 338, 363, & 413. 1965; N. Taylor, Guide Gard. Shrubs & Trees 339--341, opp. 342, & 432. 1965; Banerji, Rec. Bot. Surv. India 19: 74. 1965; Hellyer, Shrubs in Colour, pr. 1, 20 & 22 (1965) and pr. 2, 20 & 22. 1966; Panigrahi, Bull. Bot. Surv. India 8: 4. 1966; Gausson & al., Trav. Sect. Scient. & Tech. Inst. Franç. Pond. Hors ser. 7: 49, 51, 62, 67, 71, & 96 (1966) and 8: 62. 1966; Arora, Journ. Indian Bot. Soc. 45: 134. 1966; J. Rzedowski, Act. Cientif. Potos. 6 (1): 17. 1966; Gómez Pompa, Estud. Bot. Reg. Misantla 93. 1966; T. C. Whitmore, Guide Forests Brit. Solomon Is. 127, 135, 144, & 170. 1966; Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 29, 51, 166, 177, 576, 590, 913, 1059, 1062, & 1129. 1966; G. L. Davis, Syst. Embryol. Angiosp. 271. 1966; Van Steenis-Kruseman, Fl. Males. Bull. 4: 1069 & L. 1967; Moldenke, Phytologia 15: 13--41. 1967; Moldenke, Résumé Suppl. 15: 1, 2, 8--14, 16, 17, & 20. 1967; J. F. Williamson, Sunset West. Gard. Book, new ed., 207. 1967; Van Steenis, Blumea 15: 147--149 & 151, fig. 2. 1967; H. Marsh., Arbust. Amer., ed. Ewan, 22--23. 1967;

Anon., Biol. Abstr. 48 (18): S.27. 1967; Raf., Fl. Ludovic., pr. 2, 38--39 & [125]. 1967; L. V. Barton, Bibl. Seeds 774. 1967; Kawazu, Inaba, & Mitsui, Agr. Biol. Chem. 31: 494--506. 1967; Kawazu, Inaba, & Mitsui, Biol. Abstr. 48: 8109. 1967; E. Hyams, Ornament. Shrubs Temp. Zone 5: 26 & 27 (1967) and 6: 98. 1967; P. Gray, Dict. Biol. Sci. 48. 1967.

Whitmore (1966) cites his nos. 2223, 4042, 4483, & 5734 as unidentified members of this genus from the Solomon Islands, with the vernacular names "ata'ata'i'a", "aida'afi", "fai'i'isio", and "fai i'su". The species represented by 2223 and 4483 is an occasional bushy treelet in secondary regrowth forests, usually on lowlands; the other numbers represent a common small bushy tree also in secondary lowland forests. Beissner, Schelle, & Zabel (1903) use the name "Schönfrucht" for members of this genus. Rzedowski (1966) records the names "elte" and "fruta de chachalaca" for this genus [probably for C. acuminata H.B.K. and C. pringlei Briq.].

Chopra, Badhwar, & Ghosh (1965) say that the bark & roots of some species of this genus are used in India as a tonic and carminative and in cutaneous affections.

It should be noted here that the Burcardia of Rafinesque is a synonym of Campomanesia Ruiz & Pav. in the Myrtaceae, while that of Schreber is Piriqueta Aubl. in the Turneraceae; the Burchardia of Brown is a valid genus in the Liliaceae, that of Necker is Psidium L. in the Myrtaceae, while that accredited to "Auct." is Piriqueta Aubl. in the Turneraceae; the Johnsonia of Brown is a valid genus in the Liliaceae, that of Necker is Lycium L. in the Solanaceae, while that of Adanson is Cedrela P. Br. in the Meliaceae; the Sphondylocca and Sphondylococca of Willdenow and accredited to "Willd. ex Schult." are Bergia L. in the Elatinaceae, as is also the Spondylococcus of Reichenbach; and the Tomex of Forskål is Dobera Juss. in the Salvadoraceae, while that of Thunberg is Litsea Lam. in the Lauraceae.

It should also be noted here that Taylor (1966) credits Spondylococcus Mitch. to "Mitch., Diss. Bot. & Zool. 40. 1769", while actually it was first proposed in 1748 as stated by me previously.

CALLICARPA ACUMINATA H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 204. 1817.

Emended synonymy: Callicarpa subintegerrima H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 204--205. 1817.

Additional bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 204--205 (1817) and ed. quart., 2: 252--253. 1818; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Gómez Pompa, Estud. Bot. Reg. Misantla 93. 1966; Moldenke, Résumé Suppl. 15: 16. 1967; Moldenke, Phytologia 15: 14 & 27. 1967.

It should be noted here that the H.B.K. reference dates given above have been authenticated with Barnhart (1902). Gómez Pompa states that the species is rare in the Misantla region of Mexico.

FLORA
OF THE PRAIRIE PROVINCES

Bernard Boivin

Part II -- DIGITATAE, DIMERAE, LIBERAE

Sub-class 2. HERBIDAE

HERBACEOUS DICOTS

Herbs, annual or perennial, the bark poorly if at all developed. Rarely woody and if so the wood formations nearly always of a rather unusual type.

The following key also includes the herbaceous groups from the Lignidae. The very few woody types in the Herbidae will similarly appear in the key to the Lignidae, part I, page 39. And a few unusual types with a corolla of fused petals will appear in the key to the Connatae in part III.

For the beginner, the task of identification can be greatly lightened by first learning to recognize some of the more characteristic and larger families and genera. The following are recommended as a start.

1. Conifers. Nearly all have leaves that remain on the branch during the winter and persist for some 4 to 6 years; these leaves are mostly long, stiff and narrow, somewhat shaped like so many needles. Other genera with similar persistent foliage needles are: Empetrum (leaves mostly subverticillate), Loiseleuria (leaves opposite) and Phyllodoce (leaves alternate); all three have the foliage variously pubescent or glandular. Two other genera, Hudsonia and Cassiope, are vaguely reminiscent of Juniperus horizontalis in the arrangement of their reduced leaves.

WOODY DICOPSIDS

2. Salicaceae. Willows and Poplars. Both the male and female flowers form elongated catkins and the small seeds have a long fluffy pappus. The largest genus, Salix, has the unique character of buds covered by a single scale which is shaped like a hood to cover the whole bud. Other genera with flowers in catkins are: Betula (winged seeds), Ostrya (seed in an inflated bladder), Myrica (fruiting catkins in a naked spike), and Alnus (fruiting catkins in a naked raceme). In two other genera, Corylus and Quercus, the male flowers are in elongated catkins, but the female flowers seem to be in glomerules rather than catkins; both have edible hard-shelled nuts for fruits.

3. Ribes (Grossulariaceae) has palmately lobed and alternate leaves; the fruit is a berry. Two other genera have the leaves palmatilobed and alternate: Rubus (petals rather large) and Physocarpus (calyx stellate-pubescent). In two other genera the leaves are similar, but opposite: Acer (fruit a pair of samaras) and Viburnum (fruit a berry).

4. Ericales. A rather variable group, but in most species the anthers are attenuate at tip into a pair of short-stubby to long-attenuate horns. Hence the old alternate name of Bicornes, now fallen into disuse. The anthers often open by pores located at tip.

HERBACEOUS DICOPSIDS

5. Compositae include many well known flowers such as Dandelions, Sunflowers and Daisies. The flowers are rather small and packed together into a head which presents the rough appearance of a flower and is often popularly so called. Often the corollas are prolonged into radiating ligules. The head is closely surrounded by one or more rings of small bracts termed tegules. This is our largest family. The petals are fused in this family and also in families 14, 15 and 16 below, while all the others have free petals. Other units with flowers in involucreated heads are keyed out under Group 4.

6. Umbelliferae have flowers in umbels, that is with their pedicels all originating at the same point at the top of the common peduncle. A few other units with flowers in umbels are eliminated under Group 5.

7. Cruciferae have rather readily recognizable flowers in bractless racemes. The 4 unguiculate petals have the limbs spreading out in the shape of a maltese cross. The sepals are also free and 4 in number, but there are 6 stamens of which the outer 2 are shorter. The fruit (or silique) is also characteristic, being made of 4 united carpels, of which the inner two are sterile and fused face to face to form a central partition (or septum) while the outer two carpels form the outer walls (or valves) of the locules.

8. Leguminosae also have distinctive flowers. The sepals are fused while the 5 petals are free. As for the stamens, one is free and the 9 others are fused by their filaments. The flower is zygomorphic and it is the upper petal (termed standard) which gives the plant its most distinctive feature. This standard is somewhat larger than the other petals which it overlaps and its limb is bent outwardly and spreads out fan-wise. The leaves are alternate and pinnate or trifoliate. The leaflets are entire or merely serrulate. A large and readily recognized family once a few of its members are known, such as: Caragana, Pea, Clover or Bean. A few other families have zygomorphic corollas of free petals; they are keyed out under Group 9a.

9. Rosaceae. A rather heterogeneous family, but most of its herbaceous members have a double calyx with 10 lobes in two series. The inner series of 5 lobes is apparently the main one. The 5 other lobes are attached to the outside of the calyx tube and they alternate with the inner lobes. A double calyx is also found in the Malvaceae, but the latter are readily recognized by their stellate pubescence.

10. Polygonaceae. Its two larger genera are readily spotted by their unique features. In Polygonum there are two shea-

thing structures at each node. The inner and larger one, termed *ocrea*, is tubular and usually membranaceous. The outer structure is the more or less sheathing leaf-base and usually it is mostly adnate to the *ocrea*. An *ocrea* is also present in *Rumex*. And the latter has free sepals which persist in fruit, the 3 inner ones becoming much enlarged to form a three-winged structure with the seed hidden in the middle. The mid-nerve of some of the sepals is often enlarged into a seed-like "grain".

11. *Onagraceae* have a superficial resemblance to the *Cruciferae* because of their 4 free petals, but the ovary is obviously inferior and there are 8 stamens. A few other families have free petals and semi-inferior ovary, but their flowers are normally 5-merous.

12. *Caryophyllaceae* have opposite leaves and a rather rare type of inflorescence termed *dichasium*. In this type the stem ends in a single terminal flower and a pair of branches arise from the axils of the upper pair of leaves or bracts. These branches in turn end in a terminal flower and produce a secondary pair of branches from the axils of the upper bracts. And so on.

13. *Ranunculaceae*. Very heterogeneous, but represents a basic type of Flowering Plants. About half the species are in *Ranunculus*, a rather good example of primitive floral type. In this genus all the parts are free and the flower is regular; the basic number is 5 but the actual number may vary somewhat. There are commonly 5 sepals, 5 petals, many stamens and a great many achenes. The receptacle is clearly elongate and the leaves are alternate. Other genera in this family are variations of this basic type; thus *Anemone* has a simple perianth and opposite or verticillate leaves.

14. *Labiatae* are herbs with square stems, opposite leaves and obviously bilabiate flowers. The ovary is 4-lobed and matures into 4 distinct nutlets; that is, each lobe matures into a distinct nutlet.

15. *Boraginaceae* have flowers and fruits rather similar to the *Labiatae*, but the leaves are alternate, the stem is not square and most species are rather coarsely pubescent or bristly-pubescent, the larger hairs being usually inflated at base.

16. *Scrophulariaceae*. A rather diverse agglomeration, but most of its types resemble *Labiatae* with their square stems, opposite leaves and tubular, zygomorphic flowers. However, the fruit is a bilocular capsule and is not 4-lobed.

MONOPSIDS

17. *Gramineae*. A highly specialized family, not to be confused with anything else. It contains the Bluegrass from our lawns, the Brome from the roadsides and the Oats and other cereals from our fields. The family has many unique features. The stem is of the Bamboo type, that is round and hollow, with an occluding plate at each node. The leaf arises from the top of a long sheathing base. The flower is reduced to 3 stamens and an ovary. Each flower is enclosed by 2 chaffy bracts termed

lemma and palea. The flowers are gathered in short distichous spikelets. Each spikelet is subtended by a pair of chaffy bracts termed glumes.

18. Cyperaceae have a superficial resemblance to Gramineae: chaffy bracts in the inflorescence and narrow leaves with sheathing bases, but the stem is solid and nearly always triangular while the floral organization is very different. Actually there are many types of floral organization in this family but Carex, the largest genus, is readily recognized by its female flower reduced to a mere ovary and enveloped by a bottle-shaped bract termed utricule. The flowers are unisexual and borne in spikes.

19. Juncaceae is also a family of grass-like plants but here the flower is reduced only in size. It is like the flower of the Liliaceae except that the 6 perianth parts are small and chaffy.

20. Orchidaceae. This is another highly specialized family with many unique features. The ovary is inferior and the flower is strongly zygomorphic with the lower petal (termed labellum) generally larger and produced forward like a small landing stage. The style and the only stamen (2 in Cypripedium) are fused together into a rather unusual structure termed gynostemium.

21. Liliaceae have a basic and quite unspecialized type of flower with 3 free sepals, 3 free petals, 6 free stamens and a 3-locular superior ovary. The flowers are usually showy and the petals and sepals tend to be similar.

22. Potamogetonaceae are common submerged aquatics with entire leaves and spikes of insignificant flowers or achenes protruding above the surface of the water. No other plant matches this behaviour.

The 22 families characterized above comprise better than 85% of our flora and learning to recognize them should reduce the task of identification by more than half.

GENERAL KEY TO THE HERBACEOUS DICOPSIDS

- a. Plants of unusual behaviour: climbing
or parasitic on other plants Group 1
- aa. Self-supporting plants.
 - b. Flowers normally lacking or replaced
by unusual structures such as bulblets,
tufts of leaves, etc Group 2
 - bb. Flowers normally present.
 - c. Leaves vestigial, or peltate, or
carnivorous, or submerged and
finely dissected, thus the plant
is more readily identified by its
foliage Group 3
 - cc. Plants more ordinary in their foliage
and their general presentation and
more readily identified by their
flowers.
 - d. Inflorescence highly reduced
and condensed into an involucre
head (or cyathium etc.) which has
more or less come to function as
a single flower. The individual
flowers in the head may be highly
reduced Group 4
 - dd. Flowers individualized.
 - e. Flowers in umbells Group 5
 - ee. Not in umbells.
 - f. Flowers more or less
reduced.
 - g. Perianth lacking Group 6
 - gg. Perianth present
but the flowers
all unisexual Group 7
 - ff. Perianth present and
flowers all or mostly
perfect.
 - h. Perianth simple Group 8
 - hh. Perianth double.
 - i. Petals free Group 9
 - ii. Petals \pm fused part III

Group 1

Climbing or parasitic plants. Other climbers, besides those keyed out below, occur in the Lignidae and Monopsida: Smilax (leaves entire and alternate), Lonicera (leaves entire and opposite), Vitis (palmately lobed) and Parthenocissus (digitate). Another root parasite occurs in the Monopsida: Coralorhiza (flowers spicate).

- a. Both parasitic and climbing by its yellow,
leafless, twining stem Cuscuta, part III

- aa. Either parasitic or climbing.
 - b. Climbing only.
 - c. Climbing by tendrils.
 - d. Leaf simple 33. Cucurbitaceae, part I-149
 - dd. Leaf compound 16. Leguminosae, part I-71
 - cc. Climbing by twining stems or petioles
 - e. Leaves compound.
 - f. Stem twining.
 - g. Leaflets 3 Amphicarpa, part I-104
 - gg. Much more numerous Adlumia, p. 42
 - ff. Petioles twining Clematis, p. 23
 - ee. Leaves simple, entire to deeply lobed.
 - h. Leaf peltate ... 65. Menispermaceae, p. 39
 - hh. Not peltate.
 - i. Leaves opposite ..
 - 24. Cannabinaceae, part I-133
 - ii. Leaves alternate.
 - j. Leaves triangular to hastate.
 - k. Flowers large, solitary ..
 - ... 94. Convolvulaceae part III
 - kk. Flowers small, in loose racemes ..
 - Polygonum, p. 109
 - jj. Leaves ovate to cordate to trilobed Solanum, part III
 - bb. Parasitic only.
 - l. Parasitic on branches ..
 - 46. Loranthaceae, part I-173
 - ll. Parasitic on roots.
 - m. Perianth of free parts 42. Monotropaceae, part I-171
 - mm. Corolla of fused petals 96. Orobanchaceae, part III

Group 2

Lacking flowers or flowering very rarely. Also normally sterile are two groups in the Monopsida: Lemnaceae (very small, free floating aquatics) and Anacharis (submerged, leaves entire and verticillate or opposite).

- a. Flowers replaced by fleshy bulblets.
 - b. Bulblets in a terminal spike Polygonum, p. 109
 - bb. Bulblets axillary Lysimachia, p. 135
- aa. No bulblets.
 - c. Leaves entire. Shore plants Hippuris, p. 140
 - cc. Leaves serrate to finely divided.
 - d. Leaves opposite or verticillate.
 - Aquatics.

- e. Ultimate segments filiform
and entire Bidens, part III
- ee. Ultimate segments flattened
and serrulate 62. Ceratophyllaceae, p. 62
- dd. Leaves alternate.
 - f. Leaves finely dissected;
terrestrial Artemisia, part III
 - ff. Leaves serrulate; submerged
aquatic Potamogeton crispus, part IV

Group 3

Leaf or stem modified in some vary unusual manner. Note also in the Monopsida, the Lemnaceae (very small, free floating aquatics).

- a. Leaves vestigial or lacking. Stem
thick and fleshy.
 - b. Ferociously spiny 34. Cactaceae, part I-149
 - bb. Spineless Salicornia, p. 127
- aa. Leaves present.
 - c. Leaves peltate.
 - d. Polygonal and marginally
peltate 65. Menispermaceae, p. 39
 - dd. Elliptic and centrally
peltate 61. Cabombaceae, p. 36
 - cc. Not peltate.
 - e. Carnivorous bog plants. Note
also Utricularia under ee.
 - f. Leaf hollowed out, shaped
like a "horn of plenty"
and half-filled with
water 89. Sarraceniaceae, p. 159
 - ff. Leaf covered with long,
capitate processes,
like very coarse hairs,
reddish and sticky 88. Droseraceae, p. 158
 - ee. Submerged aquatics with the leaves
dissected into filiform segments.
 - g. Leaves alternate.
 - h. Leaf base narrow Utricularia, part III
 - hh. Leaf base dilated
by the adnate
stipules Ranunculus, p. 24
 - gg. Leaves opposite or verticillate.
 - i. Pectinately divided... Myriophyllum, p. 139
 - ii. Dichotomously divided.
 - j. Ultimate segments
filiform and
entire Bidens, part III
 - jj. Ultimate segments
flattened and ser-
rulate ... 62. Ceratophyllaceae, p. 62

Group 4

Flowers in dense heads and each head surrounded by one or more rings of bracts. In the Monopsida a parallel variation occurs in the Araceae where a very dense spike of florets is subtended by a spathe.

- a. The one ovary per head borne on a long stipe and exserted from the head 37. Euphorbiaceae, part I-154
- aa. Ovaries numerous and hidden among the bases of the florets.
 - b. Florets obviously pedicellate and more or less exserted from the involucre Eriogonum, p. 103
 - bb. Florets sessile or nearly so.
 - c. Flowers strongly bilabiate.
 - d. Involucre of trifoliate leaves Trifolium, part I-79
 - dd. Involucre of simple bracts 106. Labiatae, part III
 - cc. Flowers \pm actinomorphic or ligulate.
 - e. Head subtended by a reflexed tubular sheath, that is by a sheath attached at the base of the head and directed downwards, with the open end at the lower end 81. Plumbaginaceae, p. 137
 - ee. No sheath, reflexed or otherwise.
 - f. Flowers 5-merous, often ligulate... 113. Compositae, part III
 - ff. Flowers 4-merous, never ligulate.
 - g. Leaves alternate, spiny-toothed Eryngium, p. 162
 - gg. Opposite and not spiny.
 - h. Leaves entire 109. Plantaginaceae, part III
 - hh. Leaves pinna-tifid... 112. Dipsacaceae, part III

Group 5

Flowers in umbels.

- a. Ovary inferior.
 - b. Fruit a berry; petioles not sheathing at base 28. Araliaceae, part I-138
 - bb. Fruit a diachene; petioles dilated

into a \pm sheathing base 90. Umbelliferae, p. 159

aa. Ovary superior.

c. Stem leafless except for the bracts of the involucre.

d. Flowers 3-merous Eriogonum, p. 103

dd. Flowers 5-merous 80. Primulaceae, p. 130

cc. Stem leafy.

e. Leaves compound.

f. Leaves trifoliate ..

..... 101. Oxalidaceae, part III

ff. Leaves pinnate Erodium, part III

ee. Leaves simple.

g. Inflorescences arising out of

the internodes Solanum, part III

gg. Umbels terminal or axillary.

h. Umbels in a terminal leafy

corymb 37. Euphorbiaceae, part I-154

hh. Umbels solitary, mostly

axillary.

i. Leaves entire ..

..... 53. Asclepiadaceae, part I-180

ii. Leaves serrate ..

..... Chimaphila, part I-168

Group 6

Flowers without perianth.

a. Leaves opposite 85. Callitrichaceae, p. 146

aa. Leaves verticillate Hippuris, p. 140

Group 7

Flowers unisexual. Species with some unisexual flowers mixed with the perfect ones are not included in this key.

a. Leaves ternately compound 60. Ranunculaceae, p. 14

aa. Leaves simple to pinnately divided.

b. Stem-leaves pinnatipartite ..

..... 91. Valerianaceae, part III

bb. Leaves entire to lobed.

c. Flowers verticillate in terminal

spikes; ocrea present Rumex, p. 104

cc. No ocrea; flowers variously disposed.

d. Style one 23. Urticaceae, part I-132

dd. Styles 2-3.

e. Sepals and bracts herbaceous..

..... 78. Chenopodiaceae, p. 118

ee. Sepals and bracts scarious ..

..... 79. Amaranthaceae, p. 129

Group 8

Flowers perfect, or in large part perfect and mixed with some unisexual flowers. Perianth made up of a single verticil,

often termed tepals; a second verticil is sometimes present, but vestigial or falling off very early and normally lacking in herbarium specimens. The key includes some groups in which both verticils are present, but are so much alike as to seem only one.

- a. Flowers zygomorphic.
 - b. Leaves compound Adlumia, p. 42
 - bb. Leaves simple.
 - c. Leaves deeply divided.
 - d. Leaves palmatifid 60. Ranunculaceae, p. 14
 - dd. Leaves pinnatipartite ..
 - 91. Valerianaceae, p. III
 - cc. Leaves merely serrate.
 - e. Perianth petaloid and conspicuous 102. Balsaminaceae, part III
 - ee. Perianth reduced to a green bract Besseya, part III
 - aa. Flowers regular.
 - f. Ovary superior Group 8A
 - ff. Ovary inferior.
 - g. Stemless creeping herb with 2 leaves and a single flower 66. Aristolochiaceae, p. 40
 - gg. Stem present; leaves and flowers more numerous.
 - h. Leaves verticillate Galium, part I-185
 - hh. Alternate or opposite.
 - i. Alternate 47. Santalaceae, part I-173
 - ii. Opposite Chrysosplenium, p. 156

Group 8A

Group 8 with a regular flower and a superior ovary.

- a. Calyx segments fused below; leaves opposite.
 - b. Leaves obtuse or rounded at tip Glaux, p. 136
 - bb. Leaves sharply acuminate 77. Illecebraceae, p. 117
 - aa. Perianth of free parts.
 - c. Carpels numerous and free 60. Ranunculaceae, p. 14
 - cc. Carpels more or less fused.
 - d. Carpels 5, fused below the middle, obviously free above Penthorum, p. 148
 - dd. Carpels completely fused into a single compound ovary.
 - e. Flowers large and showy, the petals at least 1 cm long ..
 - 67. Papaveraceae, p. 40
 - ee. Much smaller.
 - f. Flower 3-merous; ocrea mostly present 76. Polygonaceae, p. 102
 - ff. 4-5 merous, no ocrea.
 - g. Leaves opposite ..
 - 74. Caryophyllaceae, p. 81

- gg. All or mostly alternate,
rarely vestigial.
- h. Floral parts in 4's ..
..... Lepidium, p. 49
- hh. In 5's...78. Chenopodiaceae, p. 118

Group 9

Sepals and petals present, the latter free.

- a. Flower zygomorphic Group 9A
- aa. Flower regular.
- b. Sepals usually fused; ovary inferior or
semi-inferior, or superior Group 9B
- bb. Sepals free; ovary superior.
- c. Sepals 2.
- d. Leaves entire75. Portulacaceae, p. 100
- dd. Serrate to deeply divided ..
..... 67. Papaveraceae, p. 40
- cc. Sepals 3 or more.
- e. Carpels numerous and free.
- f. Leaves peltate 61. Cabombaceae, p. 36
- ff. Not peltate 60. Ranunculaceae, p. 14
- ee. Carpels fused into a single
compound ovary Group 9C

Group 9A

Flowers zygomorphic.

- a. Flowers spurred.
- b. Sepals petaloid.
- c. Leaves remotely serrulate ..
..... 102. Balsaminaceae, part III
- cc. Leaves deeply and palmately divided ..
..... Delphinium, p. 17
- bb. Sepals green 31. Violaceae, part I-142
- aa. Not spurred.
- d. Petals deeply and palmately lobed ..
..... 72. Resedaceae, p. 80
- dd. Entire or nearly so.
- e. Sepals fused into a campanulate
to tubular calyx 16. Leguminosae, part I-71
- ee. Sepals free or practically so.
- f. Sepals petaloid Aconitum, p. 19
- ff. Sepals green 70. Capparidaceae, p. 44

Group 9B

Flower regular; sepals usually fused.

- a. Carpels more than 2 and obviously free or nearly so.
- b. Foliage very fleshy; calyx not double Sedum, p. 147
- bb. Not fleshy; calyx often double ..
..... 15. Rosaceae, part I-45

aa. Carpels only 2 or fused.

- c. Carpels clearly 2, (rarely 3), more or less fused ventrally, but the tip and the styles always free 87. Saxifragaceae, p. 148

cc. Carpels completely fused into a single compound ovary.

- d. Calyx-lobes 2 75. Portulacaceae, p. 100

dd. More than 2, usually 4 or 5.

e. Ovary inferior.

- f. Leaves compound Agrimonia, part I-67

ff. Leaves simple.

- g. Petals 10 69. Loasaceae, p. 43

gg. Petals 4-6.

- h. Petals 4... 84. Onagraceae, p. 140

- hh. Petals 6... 82. Lythraceae, p. 138

ee. Ovary superior.

i. Stem leafy, the leaves

- alternate 36. Malvaceae, part I-151

ii. Leaves opposite, or verticillate, or mostly basal.

j. Leaves verticillate ..

- Chimaphila, part I-168

jj. Leaves opposite or mostly basal.

k. Leaves and bracts opposite.

- l. Inflorescence a dense spike of opposite glomerules ..

- 82. Lythraceae, p. 138

ll. Inflorescence not spiciform ..

- .. 74. Caryophyllaceae, p. 81

kk. Leaves all or mostly basal; bracts alternate.

m. Inflorescence

- branched Limonium, p. 137

mm. Simple, a raceme or a single flower.

- n. Stamens 5; staminodes 5 or more; flower solitary ..

- Parnassia, p. 157

- nn. Stamens 10; no staminodes; flowers usually numerous ..

- ... 41. Pyrolaceae, part I

Group 9C

Sepals and petals free; sepals more than 2; single ovary.

An unusual Monopsid with a single verticil of 3 entire leaves,
Trillium part IV, may key out here.

- a. Flowers in bractless racemes, rarely with one or a few bracts at the base of the raceme 71. Cruciferae, p. 45
- aa. Flowers basal, or axillary, or in bracted inflorescences.
 - b. Leaves simple and entire.
 - c. Aquatic plant with large floating leaves and flowers 63. Nymphaeaceae, p. 37
 - cc. Terrestrial or shore plants with a well defined stem.
 - d. Leaves alternate 99. Linaceae, part III
 - dd. Leaves opposite.
 - e. Flowers axillary... 73. Elatinaceae, p. 80
 - ee. Flowers terminal or in terminal inflorescences.
 - f. Foliage dotted with black or clear dots; flowers mostly yellow ..
 38. Hypericaceae, part I-156
 - ff. Foliage not dotted; flowers not yellow ..
 74. Caryophyllaceae, p. 81
- bb. Leaves lobed to compound.
 - g. Leaves pinnate or merely lobed ..
 100. Geraniaceae, part III
 - gg. Leaves ternately compound or digitate.
 - h. Leaves trifoliate or digitate.
 - i. Flowers racemose ..
 70. Capparidaceae, p. 44
 - ii. Flowers in axillary pairs or in cymes 101. Oxalidaceae, part III
 - hh. Ternately divided into numerous leaflets.
 - j. Flowers in a raceme Actaea, p. 16
 - jj. Flowers in a few-flowered panicle Caulophyllum, p. 38

Order 34. RANALES

Receptacle elongate, often cylindric or even long linear, with the floral parts spirally arranged rather than verticillate. Flower typically regular, with all parts free, mostly in 5's, but often of a different mery, or variable in number, or very numerous.

- a. Submerged aquatics with verticillate leaves 62. Ceratophyllaceae, p. 62
- aa. Leaves alternate or opposite.

- b. Terrestrial or aquatics without floating leaves or with variously dissected floating leaves 60. Ranunculaceae, p. 14
- bb. Aquatics with entire floating leaves.
 - c. Carpels free 61. Cabombaceae, p. 36
 - cc. Carpels fused 63. Nymphaeaceae, p. 37

60. RANUNCULACEAE (CROWFOOT FAMILY)

The typical family of the order, more or less fitting the description of the latter.

- a. Climbers with opposite leaves 10. Clematis
- aa. Non-climbers.
 - b. Flower spurred.
 - c. Only 1 spur 6. Delphinium
 - cc. Spurs 5.
 - d. Small herb with entire leaves ..
 - 11. Myosurus
 - dd. Taller and the leaves compound ..
 - 5. Aquilegia
 - bb. Not spurred.
 - e. Flower very irregular 7. Aconitum
 - ee. Flower quite regular.
 - f. Perianth simple, closely subtended by a calyx-like involucre of 3 verticillate bracts 9. Hepatica
 - ff. No such involucre.
 - g. Stem-leaves opposite or verticillate 8. Anemone
 - gg. Leaves alternate or all basal.
 - h. Carpel solitary, maturing into a berry 4. Actaea
 - hh. Carpels 2 or more; fruit not fleshy.
 - i. Perianth double, of distinct sepals and petals 12. Ranunculus
 - ii. Perianth simple, of more or less petaloid sepals.
 - j. Leaf simple.
 - k. Leaf entire to toothed 1. Caltha
 - kk. Leaf palmately lobed 2. Trollius
 - jj. Leaf compound.
 - 1. Trifoliate 3. Coptis
 - ll. Leaflets more numerous.... 13. Thalictrum

1. CALTHA L.

MARSH MARIGOLD

Perianth simple, of 5-10 petaloid sepals. Fruit a group of follicles.

- a. Plant bearing only 1-(2) flowers and only one stem leaf or none 1. C. leptosepala
- aa. Flowers and stem leaves more numerous.
 - b. Sepals 1-2 cm long, follicles 13-16 mm long 2. C. palustris
 - bb. Sepals and follicles much smaller 3. C. natans

1. C. leptosepala DC. var. leptosepala -- Elkslip -- Large flower usually with 7-8 oblong-lanceolate tepals, yellowish-white ventrally, yellowish to bluish dorsally. Stem or scape erect, 1.0-2.5 dm high. Leaves broadly ovate, deeply cordate, crenate. Late spring to mid summer. Wet places above timberline. -- Y-Aka, Alta-BC.

Further south, in Idaho, there is a local var. sulfurea C.L. Hitchc. in which the sepals are of a straight yellow colour.

2. C. palustris L. var. palustris -- Cowslip, King-Cup (Souci d'eau) -- A coarse herb with a few large leaves, very conspicuous in the spring with its large yellow flowers. Leaves deltoid-reniform, dentate. Tepals 1-2 cm long, elliptic. Carpels 4-8. Late spring. Wet or boggy places. -- seK-Mack, NF, NS-Alta, US, Eur.

To the west and northwest of us our variety grades into a poorly defined var. asarifolia (DC.) Huth in which the inflorescence leaves are more coarsely and less abundantly dentate than the basal ones. Also, the stem is often arching and may become rooting in the inflorescence. All Alaska reports presumably belong to var. asarifolia.

3. C. natans Pallas -- More or less creeping on mud or in shallow water. Generally smaller and often more leafy. Flowers cream, 6-12 mm across. Carpels numerous, 4-5 mm long. Summer. Muddy shores and shallow waters. -- swK-Aka, wO-eBC, US, (Eur).

2. TROLLIUS L.

GLOBE-FLOWER

Much as in Caltha, but the leaves palmately divided and the flower with a ring of staminodia between the stamens and the tepals. Staminodia often large and petaloid.

1. T. laxus Sal. (T. albiflorus (Gray) Rydb.) -- Globe-flower -- Showy herb with large cream-coloured flowers. Stem with 2-3 leaves, these subsessile and palmatipartite. Tepals 1-2 cm long. Flower solitary at the end of the stem. Early to mid-summer. Moist places in alpine and subalpine meadows. -- Alta-BC, US.

3. COPTIS Sal.

GOLDTHREAD

Like Trollius, but the follicles stipitate and the leaf compound.

1. C. trifolia (L.) Sal. (C. groenlandica (Oeder) Fern.) -- Goldenthread (Savoyane) -- Ovaries and follicles long stipitate, the stipe often as long as the body of the fruit. Long stoloniferous with a thin yellow rhizome. Leaves all basal, trifoliate, crenate, often trilobed. Flower white, with (4)-5-(6) tepals less than 1 cm long. Late spring. Coniferous forests. -- G-(F)-K, Aka, L-SPM, NS-BC, US, (Eur).

Plants from our area and eastward are usually distinguished as C. groenlandica. The distinction is a very easy one to implement since there appears to be a distributional gap in the region of the Rockies. But like Hultén 1944, we have been unable to give a morphological basis to this distinction.

4. ACTAEA L.

BANE BERRY

Flowers with a single carpel which matures into a berry. Both sepals and petals present, petaloid and caducous. Leaf much compound.

1. A. rubra (Aiton) W. var. rubra -- Poisonberry, Snakeberry (Poison de couleuvre, Pain de couleuvre) -- Stem simple, bearing 2-3 large leaves, 2-4 times ternate. Flowers white, small, all gathered in a terminal raceme. Raceme ovoid or oblong. Peduncle about 2-4 times as long as the fruiting raceme. Fruit red. Early summer. Rich woods, mostly along watercourses. -- (K)-Mack-Y-Aka, L-NF, NS-BC, US -- F. neglecta (Gillman) Rob. (A. alba AA.) -- Fruits white. Quite common. -- Mack, L-NF, NS-Alta, US -- Var. arguta (Nutt.) Lawson -- Inflorescence elongate, often with one flower borne well down the peduncle or with a flower or reduced raceme in the axil of the upper leaf. Peduncle 1-2 times as long as the fruiting raceme. Berry red. - Y-Aka, sAlta-BC, US -- F. eburnea (Rydb.) Boivin. -- Berries white, otherwise as var. arguta. Rather common. -- swAlta-BC, US.

5. AQUILEGIA L.

COLUMBINE

All 5 petals long-spurred. Sepals 5, petaloid. Inner stamens reduced to staminodes. Fruit a group of follicles. Leaves ternately compound.

- a. Scape leafless and 1-flowered 2. A. Jonesii
- aa. Taller and many-flowered.
 - b. Flowers blue 1. A. brevistyla
 - bb. Flowers red or yellow.
 - c. Flowers yellow, the sepals sometimes tinged red 5. A. flavescens
 - cc. Flowers red.
 - d. Sepal erect, shorter than the spur 3. A. canadensis
 - dd. Spreading, longer than the spur 4. A. formosa

1. A. brevistyla Hooker -- A forest species with blue flowers bearing 5 spurs. Basal leaves twice ternate, the stem-leaves smaller. Flower with a yellow center. Spurs short, 6-7 mm long, strongly recurved. Styles short, 3-4 mm long. Late spring and early summer. Wooded shores. -- Mack-Aka, wO-BC, (US).

2. A. Jonesii Parry -- Low and very small, 1 dm high or less. Scape leafless and 1-flowered. Leaves strongly glaucous. Leaflets small, 1 cm wide or less, crowded. Flowers blue to somewhat purplish. Spurs straightish, 8-15 mm long. Staminodia lacking. Follicles glabrous and glaucous. Styles about 12 mm long. (Early summer?). High alpine, in rocky places: Waterton. -- Alta, (US).

3. A. canadensis L. var. eminens (Greene) Boivin (var. hybrida AA.) -- Wild Columbine, Meetinghouse (Glands, Gants de Notre-Dame) -- Flowers purple-red, with erect sepals, Stem 5-10 dm high. Flower center yellow. Spurs 12-20 mm long. Styles 9-13 mm long. Late spring and early summer. Galerie-forests. -- wO-ecS, US.

In the more eastern var. canadensis the spurs are longer, 20-25 mm long.

Our variety has been usually called var. hybrida Hooker, but the type of the latter comes from much farther west in the Rocky Mountains. This prompted us to examine it in 1950 and, for sure, it proved to be a specimen typical of A. brevistyla.

4. A. formosa Fischer var. formosa -- Wild Columbine -- Like the preceding, but showier, the sepals being widely spreading. Flower red. Sepals 12-23 mm long. Petals with a red spur, 10-20 mm long, and a very short yellow blade, 2-4-(6) mm long. Styles 10-15 mm long. First half of summer. Mountain woods. -- (Y)-Aka, swAlta-BC, US.

In the more southern var. truncata (Fisch. & Mey.) Jones the blades of the petals are even shorter, only 1-2 mm long. Two other varieties are also known from California.

5. A. flavescens Watson var. flavescens -- Yellow Columbine -- Quite similar to A. formosa, but the flower entirely yellow. Blade of the petal longer, 6-10 mm long. Styles a bit shorter, 8-10 mm long. Early summer. Open mountain woods. -- swAlta-BC, US -- Var. miniana Macbr. & Pays. -- Seemingly intermediate to A. formosa, the sepals being pink-tinged to salmon. But the petals yellow, with a long blade, as in var. flavescens. -- swAlta-BC, US.

Var. miniana has also been regarded as an interspecific hybrid of A. flavescens X formosa.

6. DELPHINIUM L.

LARKSPUR

One sepal long-spurred. Sepals 5, petaloid; petals 4; the flower strongly irregular. Fruit a group of follicles. Leaves palmately divided.

- a. Middle and upper leaves sessile or nearly so 3. D. Ajacis
 aa. Stem leaves long-petioled.
 b. Low, with only 1-(3) stem leaves 1. D. bicolor
 bb. Tall and very leafy 2. D. Brownii

1. D. bicolor Nutt. (D. depauperatum Nutt.; D. Nuttallia-num Pritzel) -- Prairie Larkspur -- Stem 1-6 dm high, more or less puberulent to villous above and into the inflorescence. Leaf palmatipartite into narrow segments. Inflorescence usually simple and few-flowered. Flowers blue, but the upper two petals whitish with conspicuous purple nerves. Late spring to mid summer. Montane prairies and open woods in the Rockies and the Coteau Boisé. -- swS-BC, US -- F. DeVriesii Boivin -- Flowers white. Cypress Hills. -- seAlta-sBC.

Rather variable as to pubescence, development of tuberous roots, size of tepals and depth of colouring, etc. Accordingly it is often subdivided into a series of microspecies.

2. D. Brownii Rydb. (D. glaucum AA., D. scopulorum AA.) -- Larkspur, (Pied d'alouette) -- Taller, the stem 0.5-2.0 m., glabrous throughout, even usually the inflorescence. Leaves numerous, palmatifid, the segments rhomboid-lanceolate and coarsely lobed. Inflorescence a long, narrow panicle of racemes. Flowers blue, the upper two petals yellow-white along the upper edge. Mid summer. Wettish, open woods; commonly cultivated and sometimes escaping. -- Q-BC, (US) -- F. pallidiflorum Boivin -- Flowers nearly white. Has been collected near Banff. -- Alta.

Native in light woods and openings from about the center of Saskatchewan westward. Commonly cultivated and escaping fairly readily. The known Manitoba collections are LePas 1955 and 1957, Clear Lake 1958 and Fort de Pierre in 1959. All at DAO.

D. elatum L., with the habit of the above and 4 blackish petals long-bearded in yellow, is sometimes cultivated. A collection from a coniferous forest in the Cypress Hills (UAC: DAO, photo) probably represents a planting in the wild.

3. D. AJACIS L. -- Larkspur (Bec d'oiseau, Pied d'alouette) -- Annual. Leaves numerous, ternately and pinnately divided into numerous filiform segments about 1 mm wide. Inflorescence a raceme or panicle of racemes. Flower colour variable. Petals only 2, fused. Carpel solitary, pubescent. Summer. Dumps and roadsides. -- (NS), Q-Man, BC, US, Eur.

Near D. Consolida L. and often confused with it. The latter has a glabrous ovary and a vaguely corymbose inflorescence.

A species common on the Coteau de Prairie not too far south of our borders, D. virescens Nutt., has also been reported from 3 localities in Manitoba: Lake Winnipeg Valley, Winnipeg and Netly, but we are yet unconvinced. Lake Winnipeg Valley on a Bourgeau collection is a pretty broad geographical term that covers much of Manitoba plus adjacent parts of Ontario

and of the U.S.A. There is also a Houghton collection labelled Winnipeg (HUH; DAO, photo) and it is correctly identified, but to our knowledge Houghton never came to collect in Canada; an error of labels seems likely here. We have not yet traced the Netly collection and remain sceptical in the meantime.

7. ACONITUM L.

MONKSHOOD

Flower very irregular. Sepals 5, petaloid, the upper one much larger and strongly concave (hooded). Petals poorly developed, usually 8, of which 2 are larger than the others. Fruit a group of follicles.

1. A. delphiniifolium DC. var. delphiniifolium -- Much like Delphinium in foliage and general presentation, but the flower is not spurred. Instead, the upper sepal is larger than the others and covers them like a hood. Flower purple, drying deep blue. Mid summer. Mountain meadows. -- Mack-Aka, Alta-BC, US.

Two other varieties occur in Alaska, of which var. Chamissonis (Rchb.) Boivin is a taller plant with broader leaf segments, while var. paradoxum Rchb. is also taller and its larger flowers are few or commonly only one.

8. ANEMONE L.

Leaves opposite or verticillate. Perianth simple, usually petaloid. Fruit a group of achenes. Receptacle often very much elongated. The upper pair of leaves is sometimes treated as a remote involucre.

- a. Flowers large, the tepals 2-4 cm long; style elongating to 2-5 cm in fruit.
 - b. Stem-leaves sessile and ± palmately divided 10. A. patens
 - bb. Stem-leaves short-petioled and pinnately divided, with an elongated leaf-rachis ..
..... 9. A. occidentalis
 - aa. Flower smaller; style not elongating.
 - c. Stem leaves with a long and wingless petiole.
 - d. Stoloniferous and 1-2 dm high 8. A. nemorosa
 - dd. Tufted and much taller.
 - e. Leaf-lobes serrate on one side for at least half their length 6. A. virginiana
 - ee. Merely coarsely toothed towards the tip 5. A. cylindrica
 - cc. Stem-leaves sessile or with a winged petiole.
 - f. Stem-leaves with a winged petiole and divided into numerous narrow and entire segments.

- g. 2 dm high or less and one-flowered 4. A. Drummondii
- gg. Much taller and usually many flowered 3. A. multifida
- ff. Sessile or nearly so, the segments mostly broader and more or less toothed.
 - h. Main stem-leaves 4-10 cm long ..
..... 7. A. canadensis
 - hh. Stem-leaves smaller.
 - i. Carpels heavily lanate; tepals white, more or less bluish dorsally 1. A. parviflora
 - ii. Carpels glabrous; tepals yellow 2. A. Richardsonii

1. A. parviflora Mx. -- Stem bearing only 3 verticillate leaves, the latter sessile and deeply palmately lobed, the lobes \pm oblanceolate. Tufted, the basal leaves trifoliate or nearly so. Tepals white to creamy, more or less bluish dorsally when young. Achenes heavily long-lanate. Style erect, about 1 mm long. Late spring and early summer. River flats and open woods. -- F-Aka, L-NF, NB-Q-(O)-Man-BC, US, Eur.

2. A. Richardsonii Hooker -- Similar to the preceding. Stoloniferous. Basal leaves trilobed, the lobes broadly obovate. Stem leaves similar, subsessile. Flowers yellow. Achenes glabrous. Style elongating in fruit, becoming about 5 mm long, more or less reflexed, hooked or curled at tip. Late spring to mid-summer. Wet bogs. -- (G-K)-Mack-Aka, Q, Man-BC.

3. A. multifida Poir. -- Leaves divided into numerous narrow segments mostly 2-3 mm wide. Petiole of the stem-leaves about 1 cm long, narrowly winged. Flowers very variable in size and colour. Style about 1 mm long. Fruit a globose to ovoid head of long-lanate achenes. Early summer. Open woods and wet prairies. When in flower, the following variations may be distinguished: var. hudsoniana DC. (f. galactiflora Boivin, f. leucantha Fern.) -- Flowers white to yellowish. -- Mack-Y-(Aka), NF, (NB)-Q-BC, US -- F. sanguinea (Pursh) Fern. (var. Richardsiana Fern., var. Sansonii Boivin; A. globosa Nutt.) -- Flowers pink to deep purple. More frequent than the preceding. -- K-Y, NF, Q-BC, US -- Var. saxicola Boivin -- Flowers yellow inside, bluish outside. Similar to A. lithophila and often confused with it but taller and the styles shorter, as in var. hudsoniana. -- Mack, swAlta-BC, US.

Some Churchill collections are varietally intermediate and could have been referred to var. saxicola.

A hybrid with the following species has been created experimentally and reported by Heimburger, Can. Journ. Bot. 39: 488 - 501. 1961. We admit that if such a hybrid turned up naturally, we might have difficulty in recognizing it from var. saxicola.

4. A. Drummondii Watson (A. lithophila Rydb.) -- Similar to the preceeding, but generally smaller. Mostly about 1 dm high. Flowers yellow inside, blue outside. Styles about 2 mm, elongating to 3-4 mm in fruit. First half of summer. Rocky alpine tundras. -- Mack-(Y)-Aka, Alta-BC, US.

A. lithophila is commonly distinguished on the basis of shorter styles and broader leaf segments. Fruiting heads tend to show longer styles than flowers from the same tuft, from which we would deduce that the length of the style is more related to age than taxonomy. Types with broader and narrower leaf segments grade smoothly into one another and appear to be of sporadic occurrence in the range; their taxonomic significance is not obvious.

5. A. cylindrica Gray -- Thimbleweed -- Leaves generally gathered in a single verticil of (3)-5-7 leaves. Petiole wingless, about as long as the limb. Leaf trifoliate. Leaflets sessile, 3-lobed, the lobes coarsely few-toothed. Achenes whitish-lanate. First half of summer. Moist places in semi-open areas. -- Q-BC, US.

6. A. virginiana L. var. virginiana (A. riparia AA.) -- Thimbleweed -- Much like the preceeding but the verticil made up of only 3 leaves. Other leaves, when present, are opposite and borne on the peduncles. Leaves much as in the preceeding species, but somewhat larger and the lobes serrate along the outer edge. Tepals greenish and about 1 cm long. Achenes tawny-lanate. First half of summer. Moist spots, especially in woods. -- NF, NS, NB-BC, US.

Eastward the widespread var. virginiana grades into a var. riparia (Fern.) Boivin with whitish and larger tepals, 1-2 cm long.

7. A. canadensis L. -- Stem bearing a single verticil of (2)-3 large, sessile and trifid leaves. A pair of opposite leaves is also borne on each supplementary peduncle when the latter are present. Basal leaves palmatifid. Flower large, 2-4 cm across, white. Achenes large, pilose, forming a round head, the style about as long as the body. Early summer. Open, wet places. -- K-Mack, NS-BC, US -- F. Dicksonii Boivin-- Flower double. Lacombe. -- Alta.

8. A. nemorosa L. var. bifolia (Farwell) Boivin (A. quinquefolia L. var. interior Fern.) -- Stoloniferous and producing numerous 5-foliate sterile leaves. Stem 1-2 dm high, bearing a single terminal flower and a single verticil of 3 leaves. Leaves long-petioled, trifoliate. Flower about 1 cm across, white or pinkish. Achene hirsute. Style short and hooked. Second half of spring. Sandy woods. -- WQ-Alta, US.

Var. bifolia, stat. n., A. quinquefolia L. var. bifolia Farwell, Papers Mich. Ac. Sc. Arts Lett. 1: 94. 1923, an earlier name for our variety, was originally based on a two-leaved extreme of this normally three-leaved species. Thus it was rejected by Fernald, Rhodora 37: 260. 1935 as the "name would be quite misleading and unjustified". However the Code is quite

emphatic on this point and clearly states that a "name must not be rejected because it is inappropriate or because it has lost its original meaning". We have accordingly restored the older name.

Although our plant is usually treated as specifically distinct from the eurasian A. nemorosa, the latter is barely separable by its darker rhizomes, becoming black in drying, and its flowers that are often somewhat larger. The more western var. Lyallii (Britton) Ulbr. tends to be smaller, its sterile leaves are trifoliate and its slightly smaller flower is nearly always white.

9. A. occidentalis Watson -- Towhead-Baby -- Quite like the following, but the flower whitish and the leaves more divided into shorter segments. Basal leaves \pm bipinnate, the segments \pm lobed, the lobes \pm lanceolate. Stem leaves a bit smaller and nearly sessile. First half of summer. Late snow patches and wetter alpine meadows. -- swAlta-BC, US.

10. A. patens L. var. Wolfgangiana (Besser) Koch (var. Nuttalliana Gray; Pulsatilla ludoviciana (Nutt.) Heller) -- Crocus, Prairie-Crocus (Crocus) -- The whole plant very showy and in many ways: first by its abundant and very long villosity, then by its large bluish flowers, later by its large head of elongating and plumose styles. Basal leaves ternate, the leaflets 3-partite, the segments lobed, the lobes long linear. Stem leaves 3, similar but smaller, sessile and palmately divided into only 5-9 lobes. Very conspicuous in very early spring. Prairies. -- (F), Mack-Aka, Man-BC, US, (Eur) -- F. Stevensonii Boivin -- Tepals white. Brandon. -- Man.

F. Stevensonii f. n., floribus albis. Type: Stevenson 2025, Brandon, prairie, flowers white, four plants observed in several acres of bloom, May 9, 1960 (DAO).

A generalized distributional map by Løve 1954, extends the range of our variety to western Ontario and southern Keewatin, but we know of no justifying specimens.

The eurasian var. patens has the leaves divided into somewhat broader segments, 5-10 mm wide.

A. narcissiflora L. var. interior (Hultén) Boivin was reported from N.W. Alberta by Hultén 1944, repeated by some later authors. We know of no justifying specimens.

9. HEPATICA Miller

Technically similar to Anemone, but the similarity not obvious because the 3 verticillate stem leaves are very small and located so close to the flower as to appear like a calyx of 3 sepals.

1. H. nobilis Schreber var. obtusa (Pursh) Steyermark (H. americana (DC.) Ker; H. triloba AA.) -- Liverleaf, Mouse-Ears (Trinitaire, Herbe de la Trinité) -- Leaves all basal, rather broad, reniform and trilobed, persisting till the following spring and present at flowering. Flower colour variable. Fruit

a group of hirsute achenes subtended by the persistent involucre of 3 ovate bracts. Flowering in early spring before the new leaves. Rocky deciduous woods. Prairie Coteau at Notre-Dame-de-Lourdes. -- (NS), NB-sMan, US.

An earlier mention for Manitoba was based on a collection from Cartwright's Point near Kingston, Ontario.

In our variety the lobes are broadly rounded and the terminal one is a bit shorter than wide. In the more eastern var. acuta (Pursh) Steyermark the deltoid leaf has acute lobes and the terminal one is $1\frac{1}{2}$ times as long as wide.

10. CLEMATIS L.

VIRGIN'S BOWER

Climbing by means of the twining petioles and petiolules. Shrubs with opposite leaves. Flowers much as in Anemone, the styles often very long in fruit.

a. Leaves all trifoliate.

b. Flower solitary 3. C. verticillaris

bb. Flowers in panicles or corymbs 1. C. virginiana

aa. Leaflets more numerous.

c. Flower solitary 4. C. tangutica

cc. Flowers in panicles or corymbs.... 2. C. ligusticifolia

1. C. virginiana L. -- Virgin's Bower, Devil's Darning-Needle (Herbe aux gueux) -- Flowers yellowish to greenish, the tepals only about 1 cm long. Leaflets 3, ovate, coarsely toothed to \pm trilobed. Mid summer. Galerie - forest of the Roseau River. -- (NS-PEI)-NB-O-(Man, US).

2. C. ligusticifolia Nutt. -- Virgin's Bower -- Similar to the preceding, but the flowers whitish and the leaves with 5-(7) leaflets. Mid summer. Shores and river valleys. -- Man-BC, US.

Reaches its eastern limit as a native at the Elbow of the South Saskatchewan. It is sometimes cultivated and has been picked up four times as an escape in Manitoba, at Brandon 1921, 1922, at the Fort de Pierre in 1959 and at Carman in 1960. All at DAO.

3. C. verticillaris DC. var. columbiana (Nutt.) Gray (C. columbiana (Nutt.) T. & G.; Atragene columbiana Nutt.) -- Mountain-Clematis -- Flowers blue, very large and showy. Leaflets 3, ovate, entire to coarsely toothed. Tepals 3.5-6.0 cm long. First half of summer. Dry woods. -- swS-BC, (US).

In our variety the tepals are acuminate or acuminate - caudate. In the more eastern var. verticillaris the smaller tepals are 2.0-4.5 mm long, merely acute to obtuse at summit.

In the Lake Superior area one will find another and yet undescribed type: var. grandiflora var. n., floribus majoribus, tepalis ellipticis vel elliptico-lanceolatis, 4.5-6.0 cm long, 1.5-2.5 cm lat, rotundatis et mucronatis ad summas, vel interdum subacutis. Type: Dore & Lindsay 10 723, 5 miles south of Fort William, lower talus slope of basaltic mountain, June 15,

1950 (DAO). Paratypes: Dore & Lindsay 10 759, Port Arthur (DAO). Hutchinson 44, Inter-City (DAO); Pritchard, Lake Nipigon (TRT); A.M. Anderson Kashabowie (TRT); Taylor, Hosie & Bannan 874, Thunder Cape (TRT); C. Goessl, Neillsville, Wisc. (TRT).

4. *C. TANGUTICA* (Max.) Korsh. (*C. orientalis* AA.) -- Flowers yellow, large and showy. Leaflets 5 or more, lanceolate, serrate, often trilobed. Tepals 2.5-5.0 cm long. Mid to late summer. Cultivated and sometimes escaping to roadsides, railway embankments, etc. -- S-BC, (US, Eur).

George Bugnet of Légal, Alta., claims the responsibility of having introduced this in cultivation in our region around 1912. His seeds came from India. Today it is fairly often met with in cultivation; it is rather decorative, quite hardy and requires little attention. It does also tend to spread at times and is known as an escape at Edmonton 1941 and Saskatoon 1945. In 1951 we noticed that it was behaving as a weed in the experimental plots at the Indian Head Forest Experiment Station.

11. MYOSURUS L.

MOUSETAIL

Receptacle very long, often representing about half the height of the plant. Otherwise much as in Ranunculus, but the sepals spurred.

1. *M. minimus* L. var. minimus -- (var. interior Boivin, var. lepturus (Gray) Macoun; *M. lepturus* (Gray) Howell) -- Mouse-Tail (Queue de souris) -- Small annual herb, rather inconspicuous and rarely collected. Leaves all basal, filiform, the limb indistinct from the petiole. Flowers small and insignificant. Spike of achenes 1.5-4.0 cm long. Style 0.2-0.5 mm long, nearly erect. Late spring and early summer. Wet depressions and arroyos. -- O-BC, US, Eur -- Var. aristatus (Bentham) Boivin (ssp. montanus C.R. Campbell; *M. apetalus* AA.; *M. aristatus* Bentham, ssp. montanus (C.R. Campbell) Stone) -- Style longer and more or less divergent, 0.5-1.5 mm long. Spike sometimes elongate, but more often with fewer achenes and less than 1.5 cm long. -- sS-scBC, wUS.

Individuals with a shorter spike (ssp. montanus) are infrequent but widespread in the range of var. aristatus and would seem to represent only a sporadic extreme of variation.

12. RANUNCULUS

CROWFOOT, BUTTERCUP

A basic type for the family. All parts free, regular and spirally arranged on an elongated receptacle. Sepals green, about 5, often caducous. Petals about 5, white or yellow. Stamens about 5 or about a multiple of 5. Carpels numerous, maturing into so many achenes.

a. Submerged aquatics with the leaves finely dissected into numerous filiform segments.

b. Flowers white, axillary 23. *R. aquatilis*

- bb. Flowers yellow, terminal or in a loose terminal cyme 21. R. Gmelinii
- aa. Leaf entire or the segments much broader.
 - c. Leaves elongate, elliptic to linear, entire or sometimes trilobed.
 - d. Flowers white; leaves with a thick petiole often as wide as the limb 24. R. Pallasii
 - dd. Flowers yellow.
 - e. Leaves elliptic to lanceolate; stem-leaves alternate 17. R. glaberrimus
 - ee. Leaves narrowly lanceolate to filiform, mostly geminate, opposite or in fascicles 18. R. Flammula
- cc. Leaves broader, ovate to reniform, crenate to compound.
 - f. Carpels pubescent.
 - g. Leaves deeply trifid 4. R. uncinatus
 - gg. Leaves merely crenate or sometimes pedately lobed.
 - h. Basal leaves more or less truncate at base; herbage villous 14. R. cardiophyllus
 - hh. Leaves cuneate at base; herbage puberulent 12. R. inamoenus
 - ff. Carpels glabrous.
 - i. Basal leaves merely crenate, or sometimes pedately trilobed with the central lobe linguiform.
 - j. Low and long creeping ... 22. R. Cymbalaria
 - jj. Taller, erect and tufted or solitary.
 - k. Leaves deltoid-ovate 13. R. rhomboideus
 - kk. Leaves reniform, flowers very small 16. R. abortivus
 - ii. Leaves more deeply divided Group A

Group A

- a. Stem-leaves and inflorescence-leaves all or mostly sessile or on much reduced petioles.
 - b. Plant small, even in fruit not exceeding 1 dm; sepals 2.0-3.5 mm long, the petals as long or shorter 11. R. pygmaeus
- bb. Usually taller, at least in fruit; sepals at least 4 mm long, the petals as long or longer.
 - c. Stem leaves divided into narrowly linear segments, 1-3 mm wide 15. R. pedatifidus
 - cc. Leaf segments broader, \pm lanceolate, commonly 5 mm wide 9. R. nivalis

aa. Petioles well developed.

- d. Small creeping plant, about 5 cm high; leaves usually trilobed and otherwise entire

19. R. hyperboreus

dd. Much larger and usually erect.

- e. Leaves compound

Group B

ee. Leaves simple.

- f. Stem bearing a single leaf and

a single flower 25. R. lapponicus

ff. Leaves and flowers more numerous.

- g. Sepals abruptly reflexed near the middle or the base, the tip pendant.

h. Petals usually less than 5 mm long, about as long as the sepals

4. R. uncinatus

hh. Petals much longer and much exceeding the

sepals 3. R. occidentalis

gg. Sepals more or less incurved, commonly spreading.

- i. Villous or hirsute, especially along the petioles

2. R. acris

ii. Glabrous or nearly so.

- j. Achene beak insignificant, about 0.1 mm long ..

..... 20. R. sceleratus

jj. Beak longer, 0.5-1.0 mm

long 21. R. Gmelinii

Group B

a. Flowers small, the petals only 2.5-3.0 mm

long and shorter than the sepals 5. R. pensylvanicus

aa. Flowers larger, the petals longer than the sepals.

- b. Up to 2 dm high and the leaves usually divided into numerous narrow segments.

c. Nearly glabrous; petals about 5 mm long, nearly as wide

10. R. gelidus

cc. Appressed pubescent; flowers much

larger, the petals about twice as

long as wide 8. R. fascicularis

bb. Usually much taller and the leaves merely trifoliate.

- d. Petals 4-7 mm long; sepals 3.5-5.0 mm long and abruptly reflexed from near

the base 6. R. Macounii

dd. Petals and sepals longer, the latter

± spreading and somewhat incurved at tip.

- e. Style ± straight, about 2 mm long, the stigma restricted to near the

tip 7. R. septentrionalis

ee. Recurved and only ± 1 mm long;
 stigma extending on the ventral
 side for most of the length of
 the style 1. R. repens

1. R. REPENS L. -- Buttercup (Bassinet, Pied de poule) -- Creeping herb with trifoliate leaves, large yellow flowers and spreading sepals. Becoming ascending or erect in taller and denser grass. Main leaves sometimes biternate. Sepals 5-8 mm long. Petals about half longer; 7-13 mm long, obovate to obdeltoid. Style about 1 mm long. Late spring to mid summer. Rare weed, mainly in lawns: Banff, Miette. -- G, Aka, L-SPM, NS-O, swAlta-BC, US, CA, Eur -- Cv. PLENIFLORUS -- Flowers double. Leaflets commonly broader. Naturalized in roadside ditches at Hillspring. -- O, swAlta-BC.

Two collections have also been cited for Manitoba by Scoggan 1957. Dudley, Sandilands, 1930 (WIN; DAO, photo) has been revised to R. septentrionalis. The other collection has not been located yet.

2. R. ACRIS L. var. ACRIS -- Buttercup (Bouton d'or) -- About 3-6 dm and almost skeletal, the elongate stem and branches usually bearing only one fully developed leaf. The latter palmatifid, the segments more or less lanceolate and coarsely lobed and toothed. Petals 7-13 mm long, at least twice as long as the sepals. Achenes glabrous in a round head. Mid spring to mid summer. Roadsides, ditches and wet prairies. -- G, Aka, L-SPM, NS-BC, US, Eur -- Var. LATISECTUS G. Beck (var. Stevenii AA.) -- Leaf segments broader, rhomboid to obovate. Mid summer to early fall. -- NS-(PEI), Q-Man, Alta-BC, US, Eur.

The taxonomic value of var. latisectus was discussed by Boivin 1951.

3. R. occidentalis Nutt. var. brevistylis Greene -- Rather like the following but the flowers and achenes larger. Glabrous or merely soft pubescent. Petals 7-15 mm long, commonly oblong and about twice as long as the abruptly reflexed sepals. Achenes 2-3 mm long. Style about half as long, straight to recurved. Early summer. Mountain prairies. -- (Y-Aka), wcAlta-(BC).

The typical and more coastal phase is hirsute. In 1951 we did identify and distribute as R. occidentalis a number of MacKenzie collections. These have since been revised to R. Macounii.

4. R. uncinatus D. Don (var. parviflorus (Torrey) Benson) -- Sepals abruptly reflexed at or below the middle and the leaves deeply trifid. Petals oblong to obovate, commonly about 3 mm long and about as long as the sepals. Carpel about 2 mm long. Style 1.5-2.0 mm long and strongly recurved at tip. Late spring and early summer. Moist mountain woods. -- Mack, Aka, Alta-BC, US, (CA).

Often subdivided in two varieties, with var. parviflorus designating the phase with the achenes and foliage hirsute, while the typical phase is glabrous. Both variations have about

the same distribution and seem to be equally frequent in Canada. We have examined specimens with glabrous achenes ranging from Vancouver Island to northern Alberta.

5. R. pennsylvanicus L. f. -- Leaves trifoliate and the flowers small with abruptly reflexed sepals. Strongly hirsute throughout. Petals 2.5-3.0 mm long, slightly shorter than the sepals. Fruiting head elongate-oblong. Style short. All summer. Wet woods near water. -- Mack, Aka, L-NF, (NS-PEI)-NB-BC, US, (Eur).

6. R. Macounii Britton var. Macounii -- Rather coarse species with trifoliate leaves, the sepals abruptly reflexed from near the base. Coarsely hirsute. Sepals 3.5-5.0 mm long. Petals 4-7 mm long, obovate. Carpels 2-3 mm long, the style about 1 mm long. Early summer. Wet open places. -- K-Y-Aka, NF), Q-BC.

West of us it grades into a var. oreganus (Gray) K.C. Davis, glabrous or nearly so and often smaller, commonly about 3 dm high.

7. R. septentrionalis Poiret -- Tufted, the main stem erect, the others tending to be decumbent and rooting at the nodes. Otherwise much as the preceeding but the flowers and fruit larger, the sepals spreading and longer. Petals 8-15 mm long. Carpel body 3-4 mm long, the style about 2 mm long. Early summer. Wet ground, often in woods. -- (PEI)-NB-Man, US.

Pubescence is variable and the type with the petioles and lower part of stem hispid-retrorse has been distinguished as var. caricetorum (Greene) Fern., a type perhaps more frequent around the Great Lakes, but it is also sporadic from New Brunswick to Manitoba and does not appear to be geographically restricted.

8. R. fascicularis Muhl. var. fascicularis -- Buttercup, Early Buttercup -- Small and tufted, with numerous fleshy and more or less tuberous roots. Leaf at least trifoliate, more commonly divided into numerous \pm lanceolate segments. Petals oblong, about 1 cm long. Mid spring. Dry, grassy hillsides: Falcon Lake. -- sO-seMan, US.

An earlier report for Manitoba was based on a collection from Cartwright Point near Kingston, Ont.

Saskatchewan reports are frequent and they all go back to a justifying sheet labelled "Dr. Richardson 1080, New York and Cumberland House" (CAN; DAO, photo). Considering the alternate locations, it would seem more sensible to credit this Richardson collection to New York State where the species is common rather than to Saskatchewan where it would represent a disjunction of some 500 miles from the rest of the range.

In our typical variety the leaflets tend to be cut into oblong to linear lobes, while towards the southwest it grades into a var. apricus (Greene) Fern. in which the segments tend to be entire or few-toothed and elliptic to oblanceolate.

9. R. nivalis L. var. nivalis -- The back of the sepals and the top of the peduncle densely hirsute with dark brown to blackish hairs. Stiffly erect and 1-3 dm high, usually with a

single flower and 1-3 stem leaves. Leaves tripartite to palmatipartite, the stem ones subsessile. Flower large and showy. Fruiting head elongate. Summer. Wet tundra, especially late snow patches: Churchill. -- G-K-(Mack)-Y-Aka, L, nQ, nMan, nBC, Eur -- Var. Eschscholtzii (Schlecht.) Watson (R. Eschscholtzii Schlecht., var. Suksdorfii (Gray) Benson; R. verecundus Rob.) -- Pubescence of pale yellow hairs on the sepals and peduncle. Alpine prairies, especially around snow fields. -- Y-Aka, Alta-BC, US.

10. R. gelidus Kar. & Kir. -- Inconspicuous and half buried in loose shale, the stem about 5 cm high and bearing only 1-3 leaves. Glabrous or nearly so. Leaves small, at least trifoliate and divided into numerous \pm lanceolate segments. Flowers 1-(3) on long peduncles. Early spring. Alpine scree slopes. -- (Mack, Aka), Alta-(BC), US, (Eur).

The range is extended to Yukon by Hultén 1944 but this may be only a lapsus calami as no specimen is cited and no corresponding dot appears on the map of the species.

11. R. pygmaeus Wahl. -- Much like R. nivalis, but generally smaller, as small as R. hyperboreus, the latter with a creeping stem bearing many leaves on long petioles. Glabrous to lightly pubescent, the pubescence pale. Stem about 5 cm high at flowering, elongating up to 1 dm in fruit, bearing a single leaf on a short, winged petiole. Petals 1.5-3.5 mm long, usually shorter than the sepals. All summer. Wet rocky slopes, especially around late snow patches. -- G-K-(Mack-Y)-Aka, L, Q, swAlta-BC, US, Eur.

12. R. inamoenus Greene var. inamoenus (var. elator Boivin) Carpels densely pubescent and the crenate basal leaves rounded to cuneate at base. More or less appressed-pubescent and 2-6 dm high. Leaves variable, the basal ones sometimes lobed, the others always lobed. Petals 3-6 mm long. Fruiting head cylindric, 8-20 cm long. Late spring and early summer. Shaded, moist places. -- swS-BC, US.

The more western var. alpeophilus (Nelson) Benson in which the foliage and achenes are glabrous has been collected at Yoho.

13. R. rhomboideus Goldie (R. ovalis Raf.) -- Similar to the preceding but smaller, the flowers larger and the glabrous achenes forming a globose head. Up to 2 dm high and \pm pilose. Basal leaves rhomboid-ovate, usually merely crenate. Petals 5-9 mm long, rather oblong. All spring. Wetter prairies. -- sMack, O-BC, US.

14. R. cardiophyllus Hooker var. cardiophyllus (R. pedatifidus Sm. var. cardiophyllus (Hooker) Britton) -- Carpels densely pubescent like R. inamoenus, but the basal leaves hastate and the flowers very large. Uniformly long villous throughout and 2-4 dm high. Basal leaves crenate to palmatilobed, cordate to truncate at base. Petals shiny, 10-13 mm long. Fruiting head 10-15 mm long. Early summer. Wetter prairie spots. --S-BC, US-- F. apetalus (Farr) Boivin (R. apetalus Farr) -- Petals (and sometimes sepals) lacking. -- swS-Alta, (US).

In the southwestern U.S.A. there occurs a var. subsigittatus (Gray) Benson, smaller and bearing a smaller head of achenes, usually only 5-6 mm long.

15. R. pedatifidus Sm. var. leiocarpus (Trautv.) Fern. (var. affinis (Br.) Benson; R. affinis Br.) -- Resembling the more dissected phase of R. cardiophyllus, but the segments narrower and the plant nearly glabrous throughout, yet the sepals long-villous and the peduncle short-pubescent. 1-3 dm high. Leaves pedatipartite into entire and narrowly linear segments. Petals 8-10 mm long. Fruiting head ovoid. Early summer. Rocky tundra. -- G-Aka, L-(NF), Q-(O)-nMan, swAlta, (US, Eur).

The range has been extended to B.C. by many authors, but all specimens met with in various herbaria were eventually revised to R. inamoenus var. inamoenus.

9 collections have been cited for Saskatchewan. We have examined 4 of them and all proved to belong to R. cardiophyllus, being more pubescent, with less deeply cut basal leaves, more elongate head of fruits, etc.

The typical variety has puberulent achenes. It occurs primarily in the Altai and other mountain ranges of central Asia, with a limited American range. In the more northern parts of Asia and over most of its North American range it is replaced by the glabrous-fruited var. leiocarpus. The latter name has priority at the varietal rank as will be seen by the following synonymy:

Var. leiocarpus (Trautv.) Fern., Rhodora 19: 138. 1917; R. affinis Br., Bot. App. Pary's Voy. 265. 1823; R. affinis Br. var. leiocarpus Trautv., Midd. Reise 1: 62, 1817; R. pedatifidus Sm. var. affinis (Br.) Benson, Am. Midl. Nat. 52: 355. 1954.

Var. leiocarpus has recently, Am. Midl. Nat. 52: 354-5, 1954, been rejected for our plant as of uncertain application. However the type of var. leiocarpus comes from the Taimir Peninsula, an area where only the glabrous-fruited (as its name states) phase occurs and we see no reason to question the applicability of var. leiocarpus to our plant.

16. R. abortivus L. var. abortivus (var. acrolasius Fern.) -- Thin-leaved forest species with reniform and crenate basal leaves. Inflorescence and stem leaves pedately divided. Flowers very small. Petals 1.2-2.8 mm long, slightly shorter than the abruptly reflexed sepals. Achenes glabrous and small, the beak minute. Late spring and early summer. Rich woods near water-courses. -- sMack-Aka, L-SPM, NS-BC, US.

Varies sporadically from glabrous to finely puberulent above. The latter phenotype is var. acrolasius, but such puberulent specimens have often been identified and reported upon as var. micranthus (or R. micranthus). All Canadian reports of the latter proved to be incorrect. This more southern var. micranthus (Nutt.) Gray is more or less villous throughout with hairs \pm 1 mm long.

17. R. glaberrimus Hooker var. Buddii Boivin (R. Buddii Boivin) -- Basal leaves elliptic to lanceolate, entire. The

whole plant glabrous, except the carpels. About 1 dm high. Achenes very numerous, in a globose head. First half of spring. Wet prairies and creek valleys. -- S-BC, US -- F. monochlamydeus Boivin -- Petals lacking or only 1-2 per flower. -- S-- Var. ellipticus Greene -- Carpels glabrous: Mortlach. -- S-(Alta)-BC, US.

18. R. Flammula L. var. ovalis (Big.) Benson (R. reptans L. var. ovalis (Big.) T. & G.) -- Low and long-creeping, with narrow leaves mostly in 2's or in rosettes. Puberulent. Stem at first about 2 dm high, soon decumbent and rooting at the nodes. Leaves narrowly lanceolate, about 5 mm wide. Flower most often terminal and single, about 1 cm across. Mid summer. Wet prairies. -- Mack, (Aka, NS), O, S-BC, US -- Var. filiformis (Mx.) Hooker (R. reptans L.) -- More creeping, nearly glabrous and the leaves narrower, more or less filiform and 1-(3) mm wide. Flower 6-10 mm wide. Shores, fresh or saline. -- (G), K-(Mack-Y)-Aka, L-SPM, NS, NB-S-(Alta-BC), US, Eur.

There is some disagreement about the taxonomic treatment of our varieties and as a result var. ovalis has often been used in the sense of var. filiformis. Hence a fair amount of confusion in the botanical literature. Accordingly our statement of the distribution of var. ovalis is largely restricted to such regions as we have been to confirm through the examination of specimens.

19. R. hyperboreus Rottb. var. hyperboreus -- Small creeping plant with the leaves typically trilobed, the lobes entire. Only about 5 cm high or less. Glabrous throughout. Leaves about 5 mm wide, cuneate to rounded at base. Petals only 2-3 mm long. All summer. Shores and very wet places. -- G-K-(Mack)-Y-Aka, L-(NF), Q-nMan, nwBC, US, Eur -- Var. intertextus (Greene) Boivin (R. natans C.A. Meyer var. intertextus (Greene) Benson) -- Generally larger. Leaves rather reniform, about 1 cm wide and commonly \pm cordate at base and palmately 5-lobed. Flowers a little larger, the petals 3-4 mm long. Rockies--Y, Alta, US.

Reports of var. hyperboreus by Benson 1948, Moss 1959, Hitchcock 1964 and Boivin 1966 from Raup Lake in northern Alberta were based on a sheet (CAN) since revised by A.E. Porsild and W.J. Cody to R. abortivus.

20. R. sceleratus L. (var. multifidus Nutt.) -- (Mort aux vaches, Herbe de feu) -- Achene beak minute like R. abortivus and all leaves trifid, the segments \pm trilobed, the lobes \pm 3-toothed, like the terrestrial form of the following. Erect and nearly glabrous. Stem thick, with a large central cavity. Petals 3.5-5.0 mm long. Achenes \pm 1 mm long, very numerous. Style \pm 0.1 mm long. First half of summer. Very wet places. -- Mack-Aka, NF-SPM, (NS, NB)-Q-BC, US, Eur.

21. R. Gmelinii DC. (var. Hookeri (D. Don) Benson, var. limosus (Nutt.) Hara; R. Purshii Rich.) -- Submerged aquatic with finely dissected leaves and yellow flowers. Often terrestrial and creeping, the leaves then trifid to palmatifid, the segments \pm trilobed, the lobes \pm 3-toothed. Achene beak 0.5-1.0 mm.

First half of summer. Shallow waters and muddy shores. -- F-Aka, NF, NS-BC, US, (Eur).

Exceptional collections are transitional to R. flabellaris Raf., the latter not otherwise present in our area.

Previous western reports of R. flabellaris are however quite numerous: 5 or 6 localities in Manitoba, reputedly common in Saskatchewan, one locality (Red Deer) in Alberta, and 4 or 5 localities in B.C. In an effort to ascertain the presence or absence of R. flabellaris west of Ontario, we have borrowed for study all the specimens so identified or cited from all the major relevant herbaria.

The two species may be contrasted as follows.

R. Gmelinii: leaves 1.5-2.5-(9.0) cm wide, palmatipartite to bipalmatipartite, sepals 2.5-6.0 mm long; petals 4-7 mm long; anthers 0.5-1.0 mm long; achene without corky ridge, the body 1.0-1.5 mm long, the beak 0.5-1.0 mm long.

R. flabellaris: leaves 2-12 cm across, triternatipartite to quadraternatipartite; flowers often more numerous; sepals 5-8 mm long; petals 7-15 mm long; anthers 1.0-1.5 mm long; achene with a marginal corky ridge along one side, the body \pm 2 mm long, the beak \pm 1.5 mm long.

Most western specimens proved to belong to R. Gmelinii and were so revised. Only one western specimen (from B.C.) clearly belonged to R. flabellaris, namely: J.A. Munro, Kootenay Flats, May 18, 1949 (V; DAO, photo). Another B.C. specimen, Eastham 10980 from Werner (UBC; DAO, photo), while being intermediate, was clearly closer to R. flabellaris.

No other specimen from west of Ontario could be clearly referred to R. flabellaris, but quite a few were intermediate in one way or another. Mostly these intermediates had submerged leaves large enough and dissected enough to be referred to R. flabellaris, but their floral characters were less than convincing. These intermediates were as follows.

MANITOBA: Scoggan 10961, Boissevain (CAN, MT, WIN): petals 5-6 mm; anthers 0.8-1.0 mm; achenes small and without corky crest; body of the achene 1.5-1.8 mm; beak 0.5 mm. -- Scoggan 10684, Portage La Prairie (CAN, WIN, MT; DAO, photo): petals 5-9 mm; anthers 1.2-1.5 mm; achenes small and without corky crest; body of the achene 1.2 mm; beak 0.5 mm.

SASKATCHEWAN: none.

ALBERTA: H.H. Gaetz, Red Deer (CAN, DAO, photo): petals 8-9 mm; anthers 1.2-1.5 mm; no ripe achenes, but the immature ones are rather small; submerged and emerged leaves more like those of R. Gmelinii. This was cited as R. flabellaris in Am. Midl. Nat. 40: 212. 1948. -- Moss 8863, Mackenzie Highway (DAO); petals 5.0-5.5 mm; anthers 0.5-0.6 mm; but the leaves very large and much dissected.

B.C.: Eastham 10980, East of Werner (UBC; DAO, photo): petals 7 mm; anthers 0.8 mm; achenes rather small, with a weak corky ridge, the body 1.5 mm; beak 0.7-1.2 mm; leaves wide and much dissected. -- Eastham 10980a, West of Werner (UBC, V).

RANUNCULUS

The sheet at V is practically identical to 10980, but the one at UBC is not: petals 5.0-5.5 mm; anthers 0.8-1.0 mm; achenes rather small and variable, some without corky ridge, others with a weak ridge; leaves large and much dissected. -- R.T. Ogilvie, Copper Mountain (UBC) petals 5-6 mm; anthers 1.2 mm; leaves varying from typical of the one species to typical of the other -- Calder & alii 13418, Houston (DAO): petals 8 mm; anthers 1.2 mm; otherwise similar to R. Gmelinii.

Considering that typical R. flabellaris is completely lacking from the Prairie Provinces, we are of the opinion that the intermediate specimens detailed above from Manitoba and Alberta are to be considered as extremes of variation of R. Gmelinii.

In view of the many intermediates in our area and in the rest of the range of the two taxa discussed, it would seem more realistic to revert to the older treatments of G. Don and Regel and present them as varieties of the same species. Hence the following transfer. R. Gmelinii DC. var. multifidus (Pursh) stat. n., R. multifidus Pursh, Fl. Am. Sept. 2: 736.1814 (nec Forsk. 1875); R. Purshii Rich. var. multifidus (Pursh) D. Don ex G. Don, Gen. Syst. Gard. 1: 33.1831; R. radicans C.A. Meyer var. multifidus (Pursh) Regel, Bull. Soc. Imp. Nat. Moscou 34, 2: 45.1861; R. flabellaris Raf.; R. delpinifolius Torrey.

The sheet reported by Löve 1959 from Otterburne (MT; DAO, photo) as R. flabellaris f. riparius Fern, has been revised to R. Gmelinii.

22. R. Cymbalaria Pursh (var. saximontanus Fern.; Halespertes Cymbalaria (Pursh) Greene) -- Small creeping herb with ovate and crenate leaves. Erect shoots leafless, merely bracteolate and bearing 1-3 flowers. Leaves in tufts of 2 or more. Late spring to mid-summer. Shores and ditches, wherever the water is ± alkaline. -- G-(F)-K-Y-(Aka), L-SPM, NS-BC, US, (SA), Eur.

23. R. aquatilis L. var. capillaceus (Thuill.) DC. (R. trichophyllum Chaix; Batrachium trichophyllum (Chaix) Bosch) -- (Herbe aux écrevisses) -- Submerged aquatic with white flowers and finely dissected leaves. Leaves flaccid, usually deep green. Petiole commonly around 1 cm long with adnate stipules, the free part of the petiole clearly longer than the adnate part. Achene beak short. Early summer. Quiet and shallow waters. -- K-(Mack-Y)-Aka, (L)-NF, NS-BC, US, (CA, SA), Eur -- Var. eradicatus Laest. -- Generally smaller, the stem only 0.4-1.0 mm thick. Cold waters. -- G-Mack-(Y-Aka, L-NF), NS, Q-(O)-Man, Alta, (US), Eur -- Var. subrigidus (W.B. Drew) Breitung (R. circinatus Sibth. var. subrigidus (W.B. Drew) Benson; R. subrigidus W.B. Drew) -- Leaves stiffer and often grayish. Petiole shorter, often reduced to its stipular base or nearly so. Beak of the achene (0.1)-0.2-(0.5) mm long. Early to mid-summer. Marshes and ditches, especially abundant in prairie sloughs. -- F, Mack, (NF), Q-BC, US, (CA) -- Var. longirostris (Godron) Lawson (R. longirostris Godron; Batrachium longirostre (Godron) F. Schultze) -- Much as in var. subrigidus, but the beak of the achene (0.5)-1.0-(1.5) mm long. Mid summer. Quiet

shallow waters. -- Q-O, sWS-Alta, US.

Highly variable and much divided species. We have finally rallied to the treatment of Benson 1948 in which all the segregates are reduced to varietal rank; it seems to be a realistic and practical treatment. The following key will summarize our current view of this species as it occurs in Canada.

- a. Floating leaves present and merely trilobed--
(Mack, Aka), BC var. hispidulus E.R. Drew
- aa. All leaves submerged and finely dissected.
 - b. Foliage pubescent -- F-neK var. Codyanus Boivin
 - bb. Glabrous.
 - c. Beak of the achene (0.5)-1.0-(1.5)
mm long var. longirostris
 - cc. Shorter, (0.1)-0.2-(0.5) mm long.
 - d. Achenes 2.0-2.5 mm long --
seQ var. Lalondei Benson
 - dd. Achenes clearly smaller.
 - e. Leaves stiff and mostly grayish;
petiole mostly reduced to its
dilated (stipular) base ... var. subrigidus
 - ee. Leaves flaccid; petiole commonly
rather long, usually many times
longer than the stipular base.
 - f. Stem thin, 0.4-1.0 mm thick,
commonly a much reduced
plant var. eradicatus
 - ff. Thicker.
 - g. Receptacle hirsute,
the hairs in tufts ..
..... var. capillaceus
 - gg. Glabrous to lightly
pubescent -- (NF), NS,
(NB)-Q-(O, US)
..var. calvescens (W.B.Drew) Benson

Var. Codyanus (Boivin) stat. n., R. Codyanus Boivin, Can. Field-Nat. 65: 3-4. 1951. All our other varieties are already available at varietal rank.

The typical phase is eurasian. It has floating leaves like those of var. hispidulus and somewhat larger flowers, the petals 9-14 mm long.

A report of R. trichophyllus from Baffin Island by Hultén 1944 is undoubtedly to be interpreted in the sense of var. eradicatus. Similarly, all the Greenland specimens under R. trichophyllus that we have examined have been revised to other varieties, usually var. eradicatus.

24. R. Pallasii Schlecht. -- Soft plant with large petioles, nearly as large and much longer than the limb. A short plant, stoloniferous and bearing only a few leaves and flowers.

Leaves narrowly lanceolate, entire to coarsely 3-lobed. Flower white, large. Carpels numerous, large. Mid summer. Very wet places and shallow waters among mosses. -- F-Aka, (L), Q-Man, Eur.

25. R. lapponicus L. (Coptidium lapponicum (L.) Gaud.) -- Half-burried in bog mosses and the achenes longest. Long stoloniferous. Leaves few, alternate on the rhizome, solitary on the stem. Petioles long. Limb trifid, the segments crenate to lobed. Sepals only 3. Achenes few, about 5 mm long, with a hooked beak. Early summer. Spruce bogs. -- G-Aka, L, Q-Alta-(BC), US, Eur.

13. THALICTRUM L.

MEADOW-RUE

Like Ranunculus, but the perianth of a single verticil and the achene wall more or less inflated, not closely enveloping the seed. Leaves ternately divided into numerous leaflets.

- a. Flowers perfect, axillary 1. T. sparsiflorum
- ea. Flowers commonly dioecious, borne in
bracteolate terminal panicles.
- b. Filaments white; leaflets oblong
and pubescent below 4. T. dasycarpum
- bb. Filaments purplish; leaflets ±
flabelliform, glabrous to finely
glandular below.
- c. Peduncles widely spreading and
of nearly equal length; achene
slightly compressed and reflexed ..
..... 2. T. occidentale
- cc. Peduncles ascending and of widely
varying lengths; carpels neither
flattened nor reflexed 3. T. venulosum

1. T. sparsiflorum Turcz. var. Richardsonii (Gray) Boivin
-- Each flower subtended by a reduced, yet compound, leaf. Finely glandular-puberulent. Flowers white, perfect. Filaments white, thickened. Peduncle strongly recurved below the fruiting head. Achene strongly flattened, semi-orbicular. Late spring. Forest creeks. -- Mack-Aka, nO-BC, US.

In our variety all the flowers are borne in the axil of a reduced but compound leaf and the stipe of the fruit is 1.2-3.0 mm long. The typical and asiatic phase has longer stamens and somewhat narrower achenes, while two western U.S. vicariants, var. nevadense Boivin and var. saximontanum Boivin, have some of the flowers usually borne in the axil of mere bracts and their achenes have a shorter stipe, 1 mm long or less.

2. T. occidentale Gray var. palousense St. John -- Achenes ± sigmoid and reflexed. Leaflets mostly flabellately trilobed; the lobes 3-toothed. Inflorescence often nearly reduced to a single terminal raceme. Filaments 5-10 mm long, purplish. Stigma 3.0-4.5 mm. Early summer. Woods. -- (seAka), swS-BC, US.

The more western var. Macounii Boivin is a taller plant with a more ample and more leafy inflorescence, commonly 2-4 dm long, a longer stigma, 5-6 mm long and the achenes merely spreading at maturity.

3. T. venulosum Trel. var. venulosum -- Commonly 3-4 dm high. Stiffly erect with a large terminal panicle. Glabrous or minutely glandular-puberulent. Leaflets as in the preceding. Peduncles varying greatly in size, the longest at least twice as long as the shortest but averaging less than 2 cm in length and mostly 2 per node. Filament purplish, 3-4 mm long. Stigma 1.0-2.5 mm. Achene not compressed, ascending, straight or incurved, its body 3-4 mm long. Early summer. Prairies. -- K-Mack, wQ-BC, US -- Var. Turneri Boivin (T. Turneri Boivin) -- Larger. Mostly 6-9 dm high. Peduncles mostly 3-5 per node and averaging 2-3 cm long. Filaments 4-5 mm long. Stigma about 2 mm long. Body of the fruit 4.0-4.5 mm long. Aspen groves. -- Mack-Y, Man-BC, US -- Var. Lunellii (Greene) Boivin (T. confine AA.; T. Lunellii Greene) -- Still larger, 1-2 m high and usually half supported by the adjacent vegetation in which it often gets entangled. Stigma 3.0-4.5 mm long. Body of the fruit 5.0-6.5 mm long. Mainly at the inner edge of galerie-forests along the Red River and tributaries. -- scMan, noUS.

An old collection by Bell at York Factory (QK; DAO, photo) was once reported as T. Cornuti L. and more recently as T. dasycarpum. It belongs to var. venulosum.

Eastward these varieties grade into var. confine (Fern.) Boivin. Reports of the latter from Manitoba were based on a sheet of var. Lunellii. Reports of T. dioicum L. from our area were based mainly on var. Turneri.

4. T. dasycarpum Fisch. & Lall. var. dasycarpum -- Middle and upper stem-leaves sessile or nearly so. Not glandular, but pubescent, at least on the lower surface of the leaflets. Leaflets coriaceous, mostly trilobed. Peduncles about 1 cm long. Filaments white. Anthers 1.8-2.2 mm long. Stigma 2-3 mm long. Carpels and achenes nearly always pubescent. Early summer. Woods and wet meadows. -- wQ-BC, US -- Var. hypoglaucum (Rydb.) Boivin -- Larger. Leaflets thin, usually glaucous below, often glabrous and mostly larger. Anthers 2.3-3.2 mm long. Stigma 2.5-5.0 mm long. -- swAlta-BC, US.

61. CABOMBACEAE

(FANWORT FAMILY)

Placentation parietal. Flower 3-merous.

1. BRASENIA Schreber

WATER-SHIELD

Carpels numerous. Leaves peltate.

1. B. Schreberi Gmelin -- Water-Shield, Purple Wen-Dock -- Aquatic with peltate floating leaves, the limb elliptic and entire. All submerged parts very slippery, being covered by a thick, clear and gelatinous substance. Second half of summer. Muddy lakes: Lily Pond. -- Aka, NS-(PEI)-NB-Man, BC, US, (CA), Eur, (Afr, Oc).

THALICTRUM

A single collection from our area: Boivin & Champagne 14187, Réserve Forestière Whiteshell, Lily Pond, l'extrémité de chaque rameau dressé porte un groupe de bourgeons qui se détache très facilement, 25 septembre 1960 (DAO).

62. CERATOPHYLLACEAE

(HORNWORT FAMILY)

Single genus.

1. CERATOPHYLLUM L.

HORNWORT

Submerged aquatics with reduced flowers. Perianth simple. Flowers monoecious. Female flower with a single carpel maturing into an achene.

1. C. demersum L. -- Coontail -- Submerged aquatic, with very inconspicuous flowers. Leaves verticillate, dichotomously divided into filiform segments, the latter remotely serrulate. Flowers axillary, short pedicelled. Early summer. Forming large masses in quiet waters. -- NS-BC, US, CA, Eur.

63. NYMPHAEACEAE

(WATER-LILY FAMILY)

Carpels united or buried into the receptacle. Otherwise much like the Ranunculaceae. Aquatics with large floating leaves and flowers.

- a. Petals large, very numerous, white 1. Nymphaea
 aa. Petals very small, the flower conspicuous
 mainly by its 5 yellow sepals 2. Nuphar

1. NYMPHAEA L.

WATER-LILY

Large and very showy floating flowers white, with numerous petals. Leaves also floating. Sepals 4.

- a. Sepals 4-7 cm long; leaves large 1. N. odorata
 aa. Sepals 1.5-3.0 cm long; leaves small 2. N. tetragona

1. N. odorata Aiton var. odorata (Castalia odorata (Aiton) Woodv. & Wood) -- Water-Lily, Pond-Lily (Nénuphar blanc, Lis d'eau) -- Large roundish floating leaves mostly 1-2 dm across. Peduncle inserted at or below the middle of the blade. Limb entire, the basal sinus not reaching beyond the middle of the leaf. Flower 8-15 cm across, floating. Mid to late summer. Muddy lakes. -- NF, NS-seMan, US.

The more eastern var. maxima (Conard) Boivin has somewhat larger flowers, the leaves twice larger, and the petioles striped longitudinally in purplish, the herbage not otherwise purplish.

2. N. tetragona Georgi var. Leibergii (Morong) Boivin (N. Leibergii Morong) -- Quite similar to the preceeding, but generally much smaller. Leaves 3-8 cm wide, slightly obovate, with a deep sinus, reaching at least to the middle, and usually more open. Flowers 3-6 cm wide. Nearly all summer. Usually in acid and boggy lakes, often in very deep water, hence rarely collect-

ed. -- (Mack)-Aka, Q-BC, US, Eur, (Oc).

Typical var. tetragona has somewhat larger leaves with a not so deep and less open sinus.

2. NUPHAR Sm.

Sepals and petals 5, the former yellow, the latter very small. Otherwise as the preceding.

- a. Disk of ovary red; leaves small 1. N. microphyllum
 aa. Disk yellowish-green; leaves large 2. N. variegatum

1. N. microphyllum (Pers.) Fern. (Nymphaea microphylla Pers.) -- (Petit nénuphar jaune) -- Like the following, but generally smaller. Floating leaves elliptic-ovate, less than 1 dm long. Sepals 1.5-2.0 cm long. Summer. Ponds and muddy lakes. -- (NF), NS, NB-Man, US.

2. N. variegatum Eng. (Nymphaea advena AA.) -- Beaver-Root, Bobber, Pond-Poppy (Grand Nénuphar jaune, Pied d'original) -- Aquatic with large floating leaves and large yellow flowers usually borne just above water-level. Leaves elliptic, 1-3 dm long. Sepals 2.0-3.5 cm long, often reddish towards the base. First half of summer. Quiet waters. -- (Mack-Y), L-(NF-SPM, NS-NB)-Q-(O)-Man-Alta-(BC), US.

Order 35. BERBERIDALES

Similar to the Ranales but the floral parts in 3's or 6's and the carpels often reduced to a single one. Stem often secondarily woody. Stamens opposite the petals.

- a. Carpel 1. 64. Berberidaceae
 aa. Carpels 3-6 65. Menispermaceae

64. BERBERIDACEAE

(BARBERRY FAMILY)

Shrubs or semi-shrubby herbs. Petals 6, in two series. Stamens also 6 and opposite the petals.

- a. Herb with ternately compound leaves 1. Caulophyllum
 aa. Shrub with simple or pinnate leaves 2. Berberis

1. CAULOPHYLLUM Mx.

BLUE COHOSH

Petals reduced to minute appendages opposite the sepals. Ovary soon ruptured by the fast growing seed. The mature fruit a stipitate drupe.

1. C. thalictroides (L.) Mx. var. thalictroides -- Papoose Root, Blue Cohosh (Graines à chapelet) -- Only two leaves; the lower one 3 times ternate and, being sessile, looks like a verticil of 3 leaves, each twice ternate; upper leaf much smaller. A coarse herb, dark green and glaucous. Inflorescence small. Fruits dark blue. Early spring. Deciduous woods; probably an Indian introduction: Portage, East Selkirk. -- NS, NB-Man, (US, Eur).

NUPHAR

Our plant is green, with sepals 4-5 mm long, petals \pm 1.5 mm wide, anthers \pm 0.7 mm long, and the style 0.2-0.6 mm long. The more eastern and more restricted var. giganteum Farw. is more or less purplish and has larger floral parts, sepals 6-8 mm long, petals \pm 2 mm wide, anthers 1.2 mm long and the style 1.0-1.7 mm long.

2 BERBERIS L.

BARBERRY

The typical genus of the family. Sepals 6, subtended by 3 bracts. Petals 6, opposite the sepals. Stamens 6, opposite the petals. Carpel solitary. Shrubs.

Commonly subdivided into two genera with Berberis for the simple-leaved species and Mahonia for the others. This single character is not linked to any of the more fundamental variations in inflorescence and floral structures. Quite the contrary, the variations of the latter tend to form parallel series in Berberis and Mahonia. We are not therefore accepting this subdivision because it appears to be too artificial in its nature.

- a. Leaves simple 1. B. vulgaris
 aa. Leaves compound 2. B. Aquifolium

1. B. VULGARIS L. -- Barberry (Epine-vinette) -- Spiny shrub with the leaves in clusters. Spines often trifurcate, subtending the leaf-clusters. Leaves obovate to oblanceolate, spinulose-serrate. Flowers yellow, in pendulous racemes. Fruit red. Late spring. Planted and tending to reseed itself in nearby bush, but now systematically eradicated and nearly eliminated because it is host to a very noxious wheat-rust. -- NS-(PEI)-NB-Man, BC, US, Eur.

2. B. Aquifolium Pursh (Mahonia Aquifolium (Pursh) Nutt.) -- Holly, Mahonia (Houx) -- Leaflets thick and spiny-dentate. Shrub about 1 m high. Leaves alternate, pinnate, with 5-7 sessile leaflets. Flowers golden yellow in showy clusters of erect racemes. Fruit blue. Late spring and early summer. Lightly wooded slopes. -- swAlta- BC, US -- F. repens (Lindley) Boivin (Mahonia repens (Lindley) G. Don) -- Stems and branches more or less decumbent and rooting, their erect tips up to 4 dm high. Leaflets often not shiny. -- swAlta-BC, US.

The more common f. repens is usually treated as a species, but it seems to behave rather like an ecological form of drier and more open habitats.

65. MENISPERMACEAE

(MOONSEED FAMILY)

Similar to Berberis, but the carpels commonly 3.

1. MENISPERMUM L.

MOONSEED

Atypical in this that the floral parts are in 4's. Sepals 4 or 8; petals 4 or 8; stamens 12-24; carpels 2 or 4.

1. M. canadense L. -- Moonseed, Yellow Parilla (Raisin de couleuvre) -- Climber with lightly wooded twining stems and

large leaves peltate near the margin. Leaves rather polygonal, with mostly 5-7 shallow lobes, but sometimes entire. Inflorescences nearly, but not quite, axillary. Flowers small. Fruit a dark blue drupe. Early summer. Galerie-forests. -- Q-sMan, US.

Order 36. ARISTOLOCHIALES

Floral parts in 3's as in the Berberidales, but the sepals more or less fused, the petals lacking and the ovary more or less inferior.

66. ARISTOLOCHIACEAE (BIRTHWORT FAMILY)

Not parasitic and the flowers perfect. Calyx petaloid.

1. ASARUM L.

WILD GINGER

Flower with 12 stamens and a semi-inferior ovary.

1. A. canadense L. var. acuminatum Ashe (var. reflexum AA.) -- Wild Ginger, Colicroot (Gingembre sauvage) -- A forest floor species with 2 large velvety leaves and a hidden purple flower. Leaves reniform, entire. Flower solitary, more or less hidden under the dead leaves. Calyx-lobes long acuminate. Late spring. Deciduous forests. -- swQ-sMan, US.

In the more eastern var. canadense the calyx lobes have an ovate to elliptic blade abruptly contracted to a linear appendage 0.5-1.5 cm long. In our variety the limb is narrower, ± lanceolate, and more gradually attenuate to an appendage less than 2 cm long. The two phenotypes intergrade quite a lot and are not always readily distinguishable, but var. acuminatum is the normal phase west of Lake Superior, becoming rather sporadic further east.

Order 37. RHOEDALES

Floral parts in 2's, free (except the carpels) and more or less clearly opposite. However the leaves usually alternate. This is the general pattern for the next few orders. The Rhoedales have only 2 sepals.

a. Flowers regular 67. Papaveraceae
aa. Flowers zygomorphic or bilateral.....68. Fumariaceae p. 42

67. PAPAVERACEAE

(POPPY FAMILY)

Flowers regular with the 2 sepals quickly caducous. Stamens numerous.

a. Leaf broadly reniform and palmately lobed 2. Sanguinaria
aa. Leaf serrate to ternately or pinnately divided.
b. Receptacle expanded into a conspicuous collar at the base of the flower and fruit 1. Eschscholzia

ASARUM

40

- bb. Receptacle more run-of-the-mill and
in no way expanded 3. Papaver

1. ESCHSCHOLZIA Cham.

Sepals fused together into a peaked hood and falling off as a unit before the flower opens. Receptacle enlarged into an infundibuliform structure with a spreading flange. Petals 4.

1. E. CALIFORNICA Cham. -- California-Poppy, Cup-of-Flame (Globe du soleil) -- Pod grooved; with 10 dark green lines, much in the same manner as the striated stem. Glabrous and more or less glaucous. Leaves finely tripinnatifid, the segments about 1 mm wide. Flower large and showy, yellow to orange. First half of summer. Often seeded as an ornamental and casually reseeding itself on roadsides and waste places: Dauphin. -- PEI, Man, BC, US.

2. SANGUINARIA L.

BLOOD-ROOT

Petals numerous, at least 8.

1. S. canadensis L. var. canadensis -- Bloodroot (Sang-dragon, Sanguinaire) -- Exudes an abundant brilliant-red juice from the slightest wound. Very showy spring flower with a single large reniform leaf cradling a single white flower. Stemless. Very early spring. Deciduous and rocky woods. -- NS, NB-sMan, US.

Reported from 5 or 6 localities in southern Manitoba, but we have seen no other specimen than from Sprague (CAN).

3. PAPAYER L.

POPPY

Ovary topped by a stellate crown, with 4-20 rays. Fruit opening by pores just below the crown. Petals 4.

a. Annuals and the stem leafy.

b. Sepals and stem glabrous except near

the top 1. P. somniferum

bb. Hirsute throughout 2. P. Rhoeas

aa. Perennial and stemless 3. P. nudicaule

1. P. SOMNIFERUM L. -- Poppy, Opium-Poppy (Pavot) -- Stiffly erect and somewhat glaucous annual with very large and very thin petals. Leaves more or less oblong, irregularly dentate, deeply cordate and amplexicaul. The long peduncle usually coarsely hirsute. Fruit large and nearly globular. All summer. Cultivated ornamental, casually reseeding itself in open ground: Sandy Lake, Westerham and Fort Vermilion. -- NF, NS, NB-O-(Man)-S-Alta-(BC, US), Eur.

2. P. RHOEAS L. -- Corn-Poppy (Coquelicot, Pavot) -- Much as the preceeding, but coarsely hirsute throughout. Leaves lobed, often deeply so, attenuate at base. Fruit smaller. First half of summer. Cultivated and rarely reseeding itself; not weedy with us. -- (Aka), NS, (NB)-Q-S, (BC), US, Eur, (Afr).

3. *P. NUDICAULE* L. -- Arctic Poppy (Pavot safrané) -- Perennial, the leaves all basal. Hirsute, especially on the scape. Leaves long-petioled, pinnatifid, 5-15 cm long including the petiole. Scape 2-4 dm high. Flower large, variable in colour, most commonly salmon. Summer. Casual garden escape. --Y-Aka, Man, Alta, Eur-- Var. coloradense Fedde (*P. pygmaeum* Rydb.) Leaves 1-5 cm long including the petiole. Petals 5-15 mm long, yellow to salmon. First half of summer. Talus slopes above timberline. -- Alta-BC, (US).

The only Canadian reports of *Argemone intermedia* Sweet are by Russell 1954 and (doubtfully) by Breitung 1957, on the basis of a collection from Prince, Sask., supposedly preserved at SASK. The only collection we have located in any Saskatchewan herbarium came from Nebraska and the Canadian report remains both unsubstantiated and questionable as being possibly based on cultivated material. Recently this species was alternately called *A. polyanthemus* (Fedde) G.B. Ownbey. See Mem. Torr. Bot. Club 21: 131. 1958. The argument for the change runs as follows: *A. intermedia* was described in 1828 on cultivated plants from seeds originating in Mexico; but *A. intermedia* is not known to occur to-day in Mexico, hence the current interpretation of this name must be mistaken. This argument overlooks that much of the U.S.A. of to-day were formerly part of Mexico. Texas, where *A. intermedia* is largely distributed, was a Mexican state in 1828 and did not become part of the U.S.A. until 1845, hence the seeds of *A. intermedia* could very well have originated in Mexico. Even if a type of *A. intermedia* has yet to be located, we see no obvious reason to drop this name in favour of the more recent *A. polyanthemus*.

68. FUMARIACEAE

(FUMITORY FAMILY)

Flowers bilateral or zygomorphic. Sepals only 2 as in the Papaveraceae, stamens 6 as in the Cruciferae and the flower with 1 or 2 spurs, these sometimes weakly developed.

- a. Corolla bilateral; plant climbing 1. *Adlumia*
- aa. Corolla zygomorphic, with only 1 spur.
 - b. Flower more than 1 cm long; fruit an elongated pod 2. *Corydalis*
 - bb. Flower smaller; fruit subglobose 3. *Fumaria*

1. ADLUMIA Raf.

CLIMBING FUMITORY

Flower almost unique in our flora in its bilateral symmetry.

1. *A. fungosa* (Aiton) Greene -- Canary-Vine, Fairy Creeper -- A climber by twining and entangling. Leaves 2-4 times ternately or somewhat pinnately compound. Upper part of the stem leafless, all the leaves being borne on the branches. Inflorescences extra-axillary. Flowers pearly-pink. Summer and fall. Rocky deciduous woods. -- (NS), Q-Man, BC, US.

We have seen specimens from Winnipeg and West Hawk Lake.

It has also been reported from Victoria Beach.

2. CORYDALIS Med.

Fruit an elongated pod similar to those of the Cruciferae, but without a central partition, or seemingly with a partition reduced to its marginal nerve. Flower zygomorphic, spurred on the upper side.

- a. Flowers pink and yellow, in a short few-flowered raceme1. C. sempervirens
- aa. Flowers pale yellow, in an elongate raceme 2. C. aurea

1. C. sempervirens (L.) Pers. -- Rock-Harlequin -- A delicate and glaucous herb with spurred, pink and yellow flowers. Stem leaves mostly with 3-5 leaflets, the latter ternatipartite to palmatifid. Basal leaves more divided. Pod slightly torulose. Late spring to mid summer. Usually on granitic outcrops. -- K-Aka, L-NF, NS-BC, US -- F. candida Lakela -- Flowers white. Local. -- nS, US.

2. C. aurea W. var. aurea -- Similar, but the flowers yellow and in distinct terminal racemes. Leaves bipinnate, the leaflets smaller with much narrower lobes. Pod falcate and strongly torulose. Mid spring to early summer. Loose sandy soils. -- Mack-Aka, Q-BC, US.

In our plant the pods are ± descending and the inflorescences are ± immersed in the foliage. The more southern var. occidentalis Eng. has more elongate inflorescences decidedly overtopping the foliage and the pods are ascending to erect.

3. FUMARIA L. FUMITORY

Like Corydalis, but its subglobose fruit indehiscent.

1. F. OFFICINALIS L. -- Earth-Smoke, Fumitory (Fumeterre, Bec d'alouette) -- A delicate annual weed with flowers like those of Corydalis sempervirens, but purplish and darker at tip. Leaves ternately dissected into numerous narrow segments. Flowers 8 mm long, in terminal racemes. Pod 2 mm long. First half of summer. Infrequent weed of cultivated land. -- NF-SPM, NS-Alta-(BC), US, SA, Eur.

Known from a number of localities in Manitoba and also further west at Lewvan, Gravelbourg and Beaverlodge. The Gravelbourg collection was made in the summer of 1964 and by the time it reached us by ordinary mail it was not fit for herbarium preservation.

Order 38. LOASALES

Possibly not very closely related to the neighbouring orders. Flower 5-merous. Petals free. Stamens numerous.

69. LOASACEAE (LOASA FAMILY)

Ovary inferior.

BOOK REVIEWS

Alma L. Moldenke

"THE LICHEN SYMBIOSIS" by Vernon Ahmadjian, viii & 152 pp., illus., Blaisdell Publishing Company, Waltham, Massachusetts, and London & Toronto. 1967. \$5.75.

The author, who has studied lichens all of his professional life, limits the definition of "symbiosis" to the literal "long-lasting association of dissimilar organisms" and adds "mutualism" as the term for that type of symbiosis wherein the organisms are of benefit to one another. He describes lichens as a biological group, not as a separate systematic class, in which the dominant fungal member determines the morphology, produces the fruiting bodies, becomes the sole source for taxonomic treatment, and so interacts with its algal associate as to cause growth different from that obtained by either isolate grown in nature or in culture media. He lists among the Chlorophyceae, Cyanophyceae and Xanthophyceae 26 non-specific genera found in lichen association of about 100 fungal genera with Trebouxia being the most commonly distributed and yet only rarely encountered free-living while many of the others are very common in independent living. Most of the true lichen associations are formed by Ascomycetes, a few by Deuteromycetes and still less by Basidiomycetes that also produce some lichen-like associations without any morphological differentiation.

Lichens are very durable, with some arctic species estimated at 4,500 years.

To date lichen synthesis investigations have shown that nutrition-poor substrates with slow drying are required for lichen formation from algae and fungi, that fungal spores can re-establish lichen unions in culture, that the fungal symbiont can fruit in the absence of the algal partner, and that the mycobiont fails to fruit in culture but can still form the lichenized state with algae.

This is a wonderfully interesting little book that reads easily but is crammed with valuable information on the nature and isolation of the lichen members, their physiology and chemistry. An appendix with recommended media for culture, an annotated bibliography, and a useful index are provided.

This book should prove of value to a wide range of readers from the high school age through graduate students and professional scientists.

"AMERICA'S NATURAL RESOURCES" edited by Charles H. Callison, vii & 220 pp., revised printing. Ronald Press Company, New York. 1967. \$5.00.

This book is sponsored by the Natural Resources Council of

America which is composed of 30 national and regional associations interested in the conservation and wise use of our renewable natural resources. Current statistics and legislation have been added to the decade-old earlier printing. Eleven valuable papers by outstanding workers and/or writers in the following fields - ecological approach, effects of human populations, soil, water, grasslands, forests, wild-life, parks and wilderness, land-use principles, a natural resource policy - form the text. A useful appendix introduces the authors.

This book is planned for the "vast majority of responsible citizens that lack the essential background for an informed approach to the problems of conservation". I hope they read it or acquire this desperately needed information and point of view elsewhere.

"CONSERVING NATURAL RESOURCES - PRINCIPLES AND PRACTICE IN A DEMOCRACY" by Shirley Walter Allen and Justin Wilkinson Leonard, vii & 432 pp., revised edition, illus., McGraw-Hill Book Company, New York, St. Louis, San Francisco, Toronto, London, Sydney. 1966. \$8.95.

The forerunner of this book has often been used as a college text and library source since 1955. The change in format, the updating, and the addition of a co-author to assist in these changes should make this edition perhaps even more popular. The text covers the following topics after a well thought out introduction: physical and human problems of the soil, water, atmosphere, forests, grasslands, wild animals, fisheries, minerals and metals, recreation, and human powers as natural resources. Only one paragraph is devoted to the prospect and problem of overpopulation!

Application is made to our own country for our own students, and special emphasis is made to our own form of government. "...in a democracy where people may have a part in the management of their country, there is plenty of opportunity to use rationally, build up, and distribute equably in terms of public benefit those things that people call their natural resources. This is conservation."

"Carrying out such a program requires from the citizens of a democracy continuing effort to understand their natural environment; to respect, and to submit to, police power where restraint in use and exploitation is necessary; to encourage and finance the search for knowledge and development of skills to apply such knowledge in natural-resource management, whether public or private; and, perhaps the most important of all, to accept the idea of trusteeship in behalf of all the people, rather than unrestricted ownership of any natural resource."

This book is well illustrated.

"CONSERVATION OF NATURAL RESOURCES" by Guy-Harold Smith, xi & 533 pp., illus., third edition, second printing, John Wiley & Sons, Inc., New York, London, Sydney. 1966. \$9.95.

This much-used text has grown through worthwhile changes since it first appeared in 1950. It covers virtually the same topics mentioned in the previous review but in more detail; therefore it is superior for most college courses in this subject. Its illustrations are excellent. Pertinent bibliographic references are given after each chapter; a general bibliography is listed at the end.

This book consists of the work of 19 authors. Fortunately the editor, who writes two fine chapters himself, has so planned the outline that there are no conspicuous overlappings, no regretted major omissions, and no awkward changes in writing style.

"DIFFUSION PROCESSES" by M. H. Jacobs, edited by A. K. Solomon, iv & 160 pp., illus., reprinted from "Ergebnisse der Biologie" Vol. 12, 1935. Springer-Verlag, New York & Berlin. 1967. \$6.00.

Since this far-sighted work has become over the years virtually inaccessible, it is most fortunate that we are now able to welcome this reprinting. It provides a valuable background for today's biophysical studies of the quantitative relationships between forces and flows in order to understand both the nature of biological membranes and the processes that take place on, in and through them. There is much detail on the application of and corollaries to Fick's Law and on expressing diffusion movements mathematically.

"FLORA OF TURKEY AND THE EAST AEGEAN ISLANDS - VOLUME II
edited by P. H. Davis assisted by J. Cullen and M. J. E. Coode, xii & 581 pp., illus., University of Edinburgh Press in Edinburgh, Aldine Publishing Company in Chicago 60606, Hodder & Stoughton in Australia & New Zealand. 1967. \$33.50.

It is good to notice progress in the publication of this worthwhile flora needed to replace the outdated and now little available classic "Flora Orientalis" of Boissier. This volume continues under the same editorship and covers 33 polypetalous families from the Portulacaceae through the Celastraceae. As in the first volume, it provides keys to genera and species, synonymy with reference to revisions, published illustrations, descriptions of the taxa, habitat and flowering time, citation of types and of specimens according to a grid system, phytogeographical distribution, and other items of scientific interest. It has thorough indexing and many distribution maps.

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PROVENCHERIA

3

Mémoires de l'Herbier Louis-Marie
Faculté d'Agriculture, Université Laval

FLORA
OF THE
PRAIRIE PROVINCES

A HANDBOOK
TO THE FLORA OF THE PROVINCES OF
MANITOBA, SASKATCHEWAN AND ALBERTA

by

BERNARD BOIVIN

Herbier Louis-Marie, Université Laval
and Department of Agriculture, Ottawa

Part II

Digitatae, Dimerae, Liberae

(Continued)

1. MENTZELIA L.

Stamens numerous, all fertile except sometimes the outer 5.

1. M. decapetala (Pursh) Urb. & Gilg. (Nuttallia decapetala (Pursh) Greene) -- Gumbo-Lily, Evening Star -- A coarse and very rough herb with very large white flowers of 10 petaloid appendages. Stout, erect biennial. Leaves pinnatifid. Petals 5, lanceolate, 3-5 cm long. Stamens 5, about as large and quite similar to the petals. Flowers opening at sunset. Summer. Bare, eroded badlands. -- sMan-sS-sAlta, US, (CA).

Sporadic from the Cypress Hills westward, rather rare further east; Forks of the Red Deer, Roche-Percée and Boissevain.

Order 39. CAPPARIDALES

Like the Rhoedales, but the sepals 4. Ovary unilocular.

70. CAPPARIDACEAE

(CAPER FAMILY)

Leaves trifoliate or digitate. Rather resembling the Cruciferae, but the flower slightly zygomorphous and the capsule devoid of a central partition, often stipitate.

- a. Stamens 8 or more; fruit sessile or short stipitate 1. Polanisia
 aa. Stamens 6; fruit very long stipitate 2. Cleome

1. POLANISIA Raf.

Petals retuse, equal or nearly so, but tending to be deflected toward the upper side of the flower.

1. P. dodecandra (L.) DC. var. dodecandra (P. graveolens Raf.) -- Clammy weed -- A very glutinous herb with trifoliate leaves and stiffly erect pods. Annual. Flowers in bracted racemes, the lower bracts trifoliate, the upper simple. Petals generally less than 8 mm long and the stamens slightly longer, generally less than 10 mm long. Pedicels widely divergent. Mid to late summer. Open sand, sometimes weedy. -- swQ-sS, US -- Var. trachysperma (T. & G.) Iltis -- Flowers larger, the petals at least 6 mm long, the stamens much longer, commonly 10-15 mm long. -- Man-BC, US.

Our two varieties are very weak morphologically and they grade readily one into the other. But geographically they are more sharply segregated than the above distributions would seem to indicate. Only var. dodecandra occurs in the East while in our area all specimens examined, including a Criddle collection at Aweme, belonged to the more western var. trachysperma, except a Marshall collection east of Brandon (DAO) and a Groh collection at Swift Current (DAO).

2. CLEOME L.

Petals entire and somewhat uneven in size. Stamens 6, all of the same size.

MENTZELIA

44

1. C. serrulata Pursh (Peritoma serrulatum (Pursh) DC.) -- Stinking-Clover, Spider-Flower -- Capsule very long-stipitate. Generally similar to Polanisia, but not glandular, merely glabrous or puberulent. Flowers pink. Fruit widely spreading to drooping. Early to mid-summer. Sandy soils. -- swQ-BC, US -- F. albiflora Cock. -- Flowers white. -- S, (US).

Native with us, a rare adventive further east.

Order 40. CRUCIFERALES

A single family with a number of unique features. Distinguished from the related orders by the presence of a central partition in the silique.

71. CRUCIFERAE

(CRESS FAMILY)

Flower dimerous with 4 opposite sepals, 4 opposite petals, 6 stamens of which 2 are shorter than the other 4, and 4 fused carpels. The inner 2 carpels are sterile and fused face to face to form the central partition of the fruit. The outer 2 carpels (or valves) are fertile and fused to the central partition (or septum).

- a. Silicle with a narrow septum, narrower than the width of the pod Group A
- aa. Silique not compressed or compressed parallel to the septum, the latter thus as wide as the fruit.
 - b. Fruit a silicle, that is a small silique, usually less than 3 times as long as wide Group B
 - bb. Fruit a silique, usually at least 4 times as long as wide
 - c. Silique with an indehiscent beak Group C
 - cc. Silique dehiscent to the base of the style.
 - d. Flowers white or pink to purple.
 - e. Leaves deeply dissected Group D
 - ee. Entire to merely toothed Group E
 - dd. Flowers yellow Group F

Group A

Fruit a silicle compressed perpendicular to the partition, the septum thus narrower than the width of the fruit.

- a. Leaves all basal, usually submerged.....1. Subularia p. 48
- aa. Stem leafy; terrestrial plants.
 - b. Silicle strongly flattened, more than twice as large as thick.
 - c. Silicle obdeltoid 22. Capsella p. 64
 - cc. Silicle orbicular to short-ovate.
 - d. Silicle very large, with 2 seeds in each locule 4. Thlaspi p. 52

- dd. Much smaller, the locules mostly one-seeded 2. Lepidium p. 49
- bb. Much less flattened.
 - e. Stigma quite sessile 21. Hutchinsia p. 64
 - ee. Style short to very long.
 - f. Petals yellow; pod very much inflated 19. Physaria p. 63
 - ff. Petals white; pod small.
 - g. Silicle indehiscent..... 3. Cardaria p. 52
 - gg. Silicle dehiscent..... 5. Cochlearia p. 53

Group B

Fruit a silicle, either not compressed, or compressed parallel to the septum, thus the latter is as large as the width of the fruit.

- a. Flowers white.
 - b. Basal leaves very large, 4-8 dm long; silicle subglobose 17. Armoracia p. 61
 - bb. Much smaller; silicle much flattened.
 - c. Basal rosette present and well developed 25. Draba p. 66
 - cc. Annuals without basal rosette.
 - d. Petals entire; valves of the fruit convex 30. Alyssum p. 76
 - dd. Petals deeply cleft; valves flat 31. Bertoreia p. 76
- aa. Flowers yellow.
 - e. Pod indehiscent or breaking off transversally at maturity.
 - f. Pod globose and indehiscent 24. Neslia p. 65
 - ff. Pod elongate, breaking in two at the median constriction 14. Rapistrum p. 58
 - ee. Dehiscent longitudinally.
 - g. Pod strongly flattened, at least twice as wide as thick 25. Draba p. 66
 - gg. Much less flattened.
 - h. Stem leaves much divided, bipinnatifid to bipinnate 8. Descurainia p. 54
 - hh. Leaves entire to pinnatifid.
 - i. Glabrous or with simple hairs 16. Rorippa p. 59
 - ii. Stellate-pubescent.
 - j. Stem-leaves sessile, with a sagittate base ...23. Camelina p. 64
 - jj. Stem-leaves cuneate at base 20. Lesquerella p. 63

Group C

Silique with a tapered indehiscent beak.

- a. Silique coarse and indehiscent, but monoliform

and breaking up into a series of articles

- at maturity 13. Raphanus p. 58
- aa. Silique smaller and dehiscent.
- b. Leaves entire 36. Conringia p. 79
- bb. At least dentate.
- c. Beak very flat while the body
of the silique is nearly terete... 9. Eruca p. 55
- cc. Beak not more flattened than the
body of the silique.
- d. Raceme leafy at base; at least
the lowest flower subtended by
a pinnatifid leaf..... 11. Erucastrum p. 56
- dd. Raceme leafless.
- e. Seeds in two rows in each
locule; beak short, mostly
2-3 mm long 10. Diplotaxis p. 56
- ee. Seeds in one row; beak
usually much longer....12. Brassica p. 56

Group D

Silique dehiscent to the base of the style. Flowers white
or pink to purple. Leaves deeply dissected.

- a. Silique very flat 28. Arabis p. 72
- aa. Cylindric or quadrangular to barely flattened.
- b. Foliage grayish-pubescent 26. Smelowskia p. 71
- bb. Foliage green, glabrous to lightly
pubescent.
- c. Silique straight.....18. Cardamine p. 61
- cc. Silique falcate16. Rorippa p. 59

Group E

As group D with the leaves entire or merely dentate.

- a. Flowers and fruits subsessile 35. Matthiola p. 78
- aa. Pedicels obvious and elongate.
- b. Flowers large, 2.0-2.5 cm long..... 34. Hesperis p. 78
- bb. Much smaller.
- c. Septum with a large window 6. Eutrema p. 53
- cc. Septum not perforated.
- d. Lowest flower of the raceme
borne opposite a leaf.....33. Malcolmia p. 78
- dd. Lowest flower borne well above
the uppermost leaf.
- e. Glabrous or with simple hairs.
- f. Stem leaves sagittate-
amplexicaul at base.
- g. Silique \pm 1.5 cm
long 27. Thellungiella p. 71
- gg. Much longer, about
1 dm long..... 36. Conringia p. 79
- 47 CRUCIFERAE

- ff. Stem leaves cuneate at base to petiolate ..
..... 18. Cardamine p. 61
- ee. Pubescence mostly or entirely of branched hairs.
 - h. Silique strongly flattened 28. Arabis p. 72
 - hh. Silique terete or nearly so.
 - i. Petals purple, 1-2 cm long 29. Erysimum p. 75
 - ii. Much smaller.
 - j. Silique torulose ..
..... 32. Braya p. 77
 - jj. Silique of even width... 37. Halimolobos p. 79

Group F

Silique dehiscent to the base of the style. Flowers yellow.

- a. Stem leaves entire to dentate.
 - b. Pubescence malpighiaceus 29. Erysimum p. 75
 - bb. Glabrous or nearly glabrous with some simple and forked hairs at base of stem.
 - c. Leaves narrowly linear; long attenuate at base 7. Sisymbrium p. 53
 - cc. Stem-leaves much broader and auriculate at base.
 - d. Glabrous; silique quadrangular ..
..... 36. Conringia p. 79
 - dd. Stem pilose toward the base; silique terete 28. Arabis p. 72
- aa. Leaves deeply lyrate to tripinnate.
 - e. Leaves bipinnate to tripinnate....8. Descurainia p. 54
 - ee. Lyrate to pinnatifid.
 - f. Silique short, about as long as, to much shorter than, its pedicel....16. Rorippa p. 59
 - ff. Silique many times longer than its pedicel.
 - g. Stem-leaves sessile and more or less amplexicaul 15. Barbarea p. 58
 - gg. Narrowed into a petiole....7. Sisymbrium p. 53

1. SUBULARIA L.

Silicle only slightly compressed and with many seeds in each locule. Flowers white.

- 1. S. aquatica L. var. americana (Mull. & Cald.) Boivin--
Awlwort (Alène d'eau) -- Submerged aquatic, small and inconspicuous. Leaves all basal, narrowly linear, Resembling a small Isotetes. Flowers few. Silicle obovate. Mid to late summer.

Shallows of fresh-water lakes and streams. -- G, K-Mack-(Y)-Aka, L-NF, NS, Q-S, BC, US, Eur.

Sepals ± persistent in fruit. In typical var. aquatica from Eurasia and Alaska the sepals are deciduous, the fruit is generally somewhat narrower and the pedicels are frequently more divergent.

2. LEPIDIUM L.

PEPPERGRASS

A main type, with a very flat and short silicle. Each locule with only one seed. Silicle compressed perpendicular to the septum, the latter very narrow. Stamens often only 4 or 2. Petals white, sometimes lacking.

- a. Upper leaves deeply cordate-clasping and seemingly perfoliate 1. L. perfoliatum
- aa. Leaves sessile or petiolate.
 - b. Silicle 5-6 mm long.
 - c. Silicles on spreading pedicels..... 2. L. campestre
 - cc. Pedicels stiffly erect to appressed 3. L. sativum
 - bb. Silicle much smaller, 2.0-3.5 mm long.
 - d. Silicle entire at tip 4. L. latifolium
 - dd. Silicle deeply retuse at summit.
 - e. Silicle nearly orbicular..... 6. L. densiflorum
 - ee. Silicle longer, short-elliptic, about $1\frac{1}{2}$ times as long as wide.
 - f. Silicle puberulent or at least short ciliate..... 8. L. ramosissimum
 - ff. Glabrous.
 - g. Main stem-leaves serrately lobed 7. L. Bourgeauanum
 - gg. Remotely pectinately partite 5. L. ruderales

1. L. PERFOLIATUM L. -- Upper leaves seemingly suborbicular and perfoliate, but actually deeply cordate and the basal lobes overlapping. Lower leaves bipinnatipartite to tripinnatipartite, the segments narrow. Herbage somewhat glaucous. Branching tending to dichotomy. Silicle about 4 mm long. Late spring to early summer. A rare weed of roadsides and railway sidings. -- sO, swS-swAlta-BC, US, Eur.

2. L. CAMPESTRE (L.) Br. -- Cow-Cress, Field-Cress (Cresson des champs, Passerage sauvage) -- The large silicle somewhat spoon-shaped, that is somewhat concave above and quite convex below. Soft puberulent throughout. Leaves finely toothed. Pedicels spreading horizontally, the finely vesiculose silicles ascending. Late spring to late summer. Uncommon weed of disturbed soils, mostly along roads and railways. -- NF, NS-O, swAlta-BC, US, Eur.

We know it in our area only from Frank and Macleod (both at DAO).

3. L. SATIVUM L. -- Garden-Cress (Cresson alénois, Cres-

son des jardins) -- Like the preceeding with a large and somewhat spoon-shaped silicle, but borne on a nearly erect pedicel. The whole plant glabrous and slightly glaucous. Leaves pinnatipartite to tripinnatipartite. Late spring to late summer. Sometimes cultivated and readily reseeding itself in loose soils. -- (G), Mack-(Y), NS-Alta-(BC, US), Eur.

The only Manitoba location is Winnipeg from where it was reported by Bourgeau in 1863, by Macoun in 1883 and where we found it again in 1959.

4. L. LATIFOLIUM L. -- (Grande passeraie, Herbe au poivre) Tall stoloniferous perennial. About 1 m high and glabrous except the pilose silicles. Leaves thickish, ovate to lanceolate, serrate. Silicle not retuse at tip. Mid summer. Locally naturalized around a slough: Lethbridge. -- Q-O, Alta, US, (CA), Eur.

5. L. RUDERALE L. -- Peppergrass (Puette, Cresson puant) -- Petals lacking and lower leaves much divided. Basal leaves bipinnatipartite to tripinnatipartite; stem-leaves pinnatipartite to bipinnatipartite; inflorescence-leaves quite entire, narrowly linear-ligulate, slightly wider above the middle, rounded and perhaps thickish at tip. Racemes all or nearly all elongate. Silicle 2.0-2.5 mm long, glabrous, short-elliptic, with acutish shoulders and a septum 0.5 mm longer than the width of the silicle. Late spring and early summer. Infrequent weed of sidewalks and laneways in towns and cities. -- NS-S, (US), Eur.

Known from a few towns and cities in southern Manitoba, but yet only from Regina in Saskatchewan (REG; DAO, photo).

6. L. densiflorum Schrader var. densiflorum (var. Bourgeauanum AA., var. macrocarpum Mulligan; L. apetalum AA.) -- Peppergrass -- Silicles small and nearly round, the septum as long as the width of the fruit. Lower leaves \pm lobed; stem-leaves toothed; inflorescence leaves remotely serrate to entire. Racemes all or mostly elongate. Petals small and inconspicuous. Silicle glabrous, about 2.5 mm long, the shoulders rounded or obtuse. Early to mid-summer. Light soils, especially if disturbed, in open or semi-open places, often weedy. -- Mack-Aka, L-NF, NS-BC, US, Eur -- Var. elongatum (Rydb.) Thell. -- Silicle minutely ciliate. Val-Marie, Craigmyle. -- Y-Aka, S-BC, (US).

7. L. Bourgeauanum Thell. -- Usually with many elongate terminal racemes and more numerous, short, axillary ones. Leaves varying from deeply lobed at base to remotely serrate or entire in the inflorescence. Main branches numerous or many, and mostly of about the same length. Petals short and inconspicuous. Silicle glabrous, 2.5-3.5 mm long, short-elliptic, the shoulders acutish, the septum obviously longer than the width of the fruit. Disturbed or sandy soils. Early to mid summer. -- Mack-Aka, NF, NB-BC, US, Eur.

Native with us, a weed further east.

Quite closely related to the eurasian L. apetalum to which it might perhaps be realistically attached as a variety based primarily on type of pubescence.

The trio Bourgeauanum-densiflorum-ramosissimum is made of rather similar plants and the distinctiveness of one of them, L. Bourgeauanum, was recently questioned by one of the specialists of the group. We find the three to be reasonably distinct and they may be further contrasted as follows on their general appearance in typically full grown plants.

L. densiflorum -- Racemes few (or single) or, if more numerous, tending to form a corymb. Branches borne in the upper part of the plant only, strongly ascending and simple or some of the primary branches ramified and bearing 2-3 terminal and subterminal racemes. (In the other two, the branching is more elaborate and is not confined to the upper part of the plant). Racemes all or nearly all elongated, the longest commonly twice as long as the shortest. (More unequal in the other two, the main racemes being 2-6 times longer than the many short ones). Raceme at the end of the stem developing earlier and becoming longer than all or most other racemes. Pedicels elongating slowly in such a way that each raceme will be of a uniform width below, but will be gradually narrower in the last 3-5 cm. (More quickly elongating in the other two, so that the raceme is narrowed only in the last centimeter or so).

L. Bourgeauanum -- Branches numerous and \pm isomegueth, bearing many and strongly dimegueth racemes. Branching, tending to form a leafy, elongated and compound raceme of racemes. Each primary branch bearing a terminal raceme and a few lateral and short ones, so that the short racemes are more numerous than the long ones. Branches shorter than in the next, the terminal raceme usually longer than the rest of its branch. Terminal racemes developing simultaneously and the central one not especially longer than the rameal ones.

L. ramosissimum -- More branchy and the leaves more deeply cut. Rosette leaves (and lower stem leaves) pinnatipartite (pinnatifid in the other two species), the stem leaves pinnatifid (serrate to lobed in the other two), and the inflorescence leaves at least in part remotely lobed (entire to serrate in the other two). Generally branched to the base and the lower branches successively longer, the lowermost becoming about as long as the stem. Racemes very numerous and less strongly contrasted in length; each primary branch bears an elongated terminal raceme and a number of lateral ones, some of which elongate, others don't, so that in fully grown plants the elongated racemes tend to be more numerous than the short ones.

These characters give to each member of the trio a distinctive habit in the field, over and above the finer points of floral and fruit morphology. As is often the case with annuals, there is however much variation in response to drought, tramping, browsing and other factors. The type and a probable isotype of L. Bourgeauanum were examined a few years ago; both belong quite clearly with this name as interpreted here and by G.A. Mulligan in Madroño 16: 89. 1961.

8. L. ramosissimum Nelson (L. divergens Osterh.) -- Silicle finely puberulent at least along the edges, otherwise simi-

lar to that of *L. ruderale* but a bit longer, 2.5-3.0 mm long. Generally very branchy and branched from the base with the lower branches nearly as long as the stem. Main leaves deeply lobed; inflorescence-leaves at least in part remotely lobed. Racemes numerous, variable in size, mostly elongate. Petals $\frac{1}{2}$ to $\frac{3}{4}$ as long as the sepals. All summer. Open or disturbed ground, often weedy. -- Mack, Q-BC, US.

Known east of us only as an adventive.

3. CARDARIA Desv.

HOARY CRESS

Differs from *Lepidium* by its indehiscent silicle, not so much flattened.

- a. Silicle glabrous 1. *C. Draba*
 aa. Pubescent 2. *C. pubescens*

1. *C. DRABA* (L.) Desv. var. *DRABA* (*Lepidium Draba* L.) -- Hoary Cress -- Silicle broadly cordate. Nearly glabrous perennial. Leaves thickish, serrulate, the upper amplexicaul. Inflorescence a corymb of racemes. Sepals 1.5-2.0 mm long. Silicle 2.5-3.5 mm long, clearly flattened. Locules one-seeded. Early summer. Infrequent weed of roadsides and cultivated fields. -- (NS, Q)-O-BC, US, Eur -- Var. *REPENS* (Schrenk) O.E. Schulz (*C. chalapensis* (L.) Mazz.) -- Sepals 2.0-2.5 mm long. Silicle 2.5-8.0 mm long, variable in shape, rounded to truncate at base. Locules mostly two-seeded. -- O-BC, US, Eur.

The value of var. *repens* is not obvious: the variation is continuous, the habitat is the same and the distribution differs little. However specimens with small and reniform pods have $2n = 64$ chromosomes while those with larger pods have $2n = 80$. This implies a certain genetic individuality for each of these minor phenotypes. Presumably this should lead to the development of an individualized distribution for each variety, at least in their country of origin.

There occurs near Lethbridge (DAO) some colonies of more or less intermediate morphology, partial sterility and variable chromosome number: $2n = 66, 67, 68, 69, 70$ and 72 . Likely, these may be inter-varietal hybrids.

2. *C. PUBESCENS* (C.A. Meyer) Jarm. (var. *elongata* Rollins) -- Quite like the preceeding, but pubescent throughout. Silicle short ovoid, barely compressed. Summer. Roadsides and cultivated fields. -- Man-BC, US, Eur.

4. THLASPI L.

PENNY-CRESS

Like *Lepidium*, but each locule with 2 seeds.

1. *T. ARVENSE* L. -- Frenchweed, Stinkweed (*Cennes*, Herbe aux écus) -- Silicle largest, 8-12 mm wide. Upper leaves clasping, the margin sinuate. Silicle ovate, very flat, with a wide peripheral wing and a deep terminal notch, becoming yellowish and very conspicuous at maturity, borne erect on widely divergent pedicels. Late spring to late fall. Common weed of dis-

turbed soils and crop fields. -- G, Mack-Aka, L-SPM, NS-BC, US, Eur.

5. COCHLEARIA L.

SCURVY GRASS

Similar to *Cardaria* and *Lepidium* but the silicle only slightly compressed and each locule containing many seeds.

1. *C. officinalis* L. (var. *groenlandica* (L.) Gelert) -- Scurvy-Grass (*Cuilleree*, *Herbe aux cuillers*) -- Fleshy and very variable, 1-40 cm high, etc. Usually with many branches from near the base. Glabrous. Leaves entire, the lower long-petioled and cordate to reniform. Silicle 3-8 mm long, subglobose to lanceolate. First half of summer. Sea-shores; more rarely weedy or some distance inland. -- G-Aka, L-SPM, Q-nMan, BC, (US), Eur.

Rather variable as to height, branching, size of flowers, shape and size of fruits, etc. These variations have been made the basis for a number of varieties and species, but the taxonomic treatment often varies from flora to flora and we are yet unconvinced that any one such classification is more satisfactory than the others.

6. EUTREMA Br.

Like *Draba* or *Cardamine*, but the septum with a large window, the latter sometimes so large that the septum is almost reduced to its marginal nerve.

7. *E. Edwardsii* Br. -- Glabrous and slightly fleshy perennial, resembling a *Draba*, but the pod narrower, and only slightly compressed. Erect and simple, 1-2 dm high. Leaves entire, the lower long-petioled, the upper sessile and ± lanceolate. Pedicels divergent and arching. Silique 1.0-1.5 cm long, stiffly erect and parallel to the rachis, narrowly lanceolate, barely compressed, almost quadrangular because of the strong mid-nerve of the valves. Early summer. Springy spots in the tundra. -- (G), F-Mack-(Y-Aka), Q, nMan, swAlta-BC, Eur.

7. SISYMBRIUM L.

HEDGE MUSTARD

Flowers yellow; fruit a silique; hairs simple or lacking. Leaves usually deeply divided.

a. Pedicels and siliques closely appressed.... 1. *S. officinale*
aa. Divergent at 45° or more.

b. Leaves all or mostly entire 4. *S. linifolium*
bb. All pinnatifid.

c. Siliques 5-10 cm long 2. *S. altissimum*
cc. Shorter, 1-4 cm long..... 3. *S. Loeselii*

1. *S. OFFICINALE* (L.) Scop. (var. *leiocarpum* DC.) -- Hedge-Mustard (*Herbe au chantre*, *Tortelle*) -- Branches few, elongate and spreading at 90°. Herbage at least slightly hirsute below. Leaves pinnatifid, the terminal lobe larger and often hastate. Pedicels very short, 1-7 mm long, and appressed. Si-

lique about 13 mm long, tapered from the middle. Style up to 1 mm long. Summer. Disturbed soils, especially in towns and cities. -- (G, Aka, NF)-SPM, NS-Man, (Alta)-BC, US, (CA), Eur, (Afr, Oc).

Easily confused with Brassica nigra, the latter has been erroneously reported from our area.

2. S. ALTISSIMUM L. -- Tumbling Mustard (Moutarde roulante)

-- Inflorescence leaves reduced to filiform segments. Very branchy and diffuse, spreading-pilose below. Leaves pinnatifid to pinnate, the segments entire to lobed. Siliques about 8 cm long, stiffly divergent at a 45° angle. Summer. Common in disturbed soil and cultivated fields. -- (G), Mack-(Y)-Aka, NF, NS-BC, US, Eur.

3. S. LOESELII L. -- Siliques 1-4 cm long, widely divergent on thin pedicels. Reflexed-pubescent below. Leaves pinnatifid with the terminal lobe usually hastate. Silique often slightly incurved. Summer. Weed of roadsides and fields, more common in the drier parts. -- Q-BC, US, Eur.

4. S. LINIFOLIUM Nutt. (Schoenocrambe linifolia (Nutt.) Greene) -- Very branchy perennial, the very narrow leaves mostly entire. Quite glabrous throughout. Siliques divergent, 3-6 cm long. Early summer. Dry pasture land; Fort Saskatchewan. -- Alta-BC, US.

Introduced from further west.

Often placed in a segregate genus because of the position of the stigmas and because it is perennial. In our specimens the stigmatic lobes are clearly placed above the placentas, same as Sisymbrium, and we are not impressed that perennity alone is in itself such a strong character as to justify generic segregation.

8. DESCURATNIA Webb & Berth.

TANSY-MUSTARD

Like Sisymbrium, but the leaves more divided, pinnate to tripinnate and the hairs branched to stellate or glandular.

a. Silique oblanceolate, rather short and not more than twice as long as its pedicel.

b. Not glandular; pedicels 2-6 mm long ..

..... 2. D. Richardsonii

bb. Nearly always glandular; pedicels

6-15 mm long 3. D. pinnata

aa. Silique linear and longer, at least twice as long as its pedicel.

c. Hairs mostly stellate and not glandular....1. D. Sophia

cc. Not stellate, the hairs mostly simple

and glandular 4. D. sophioides

1. D. SOPHIA (L.) Webb (Sisymbrium Sophia L.; Sophia multifida Gilib.) -- Tansy-Mustard, Flixweed (Sagesse des chirurgiens, Moutarde de chien) -- Very common annual weedy Crucifer, with the grayish-pubescent leaves very finely divided, bipinnate to tripinnate. Pedicels widely ascending. Siliques ± erect.

Late spring to mid-summer. Common weed of light, bare soils.-- G, Mack-Y, NF, NS-BC, US, (Eur).

2. D. Richardsonii (Sweet) O.E. Schultz var. Richardsonii (Sisymbrium incisum var. Hartwegianum AA.; Sophia Richardsoniana sphalm.)-- Tansy-Mustard -- Much like the preceding and similarly grayish stellate-puberulent, but the pedicels 2-6 mm long, strongly ascending to appressed. Siliques 3-10 mm long, straight. Summer. Roadsides and other bare soils. -- Mack-Aka, Q-BC, US.

In var. macrosperma O.E. Schulz (including var. procera (Greene)Breitung) from the western U.S. the herbage is glabrous or nearly so. Var. procera was listed for Waterton, Alta., by Breitung 1957 but the one specimen examined, A.J. Breitung 16357 (ALTA; DAO, photo) turned out to be D. pinnata var. filipes.

We must however mention that two collections from Whitehorse and one from Maple Creek have the foliage pubescent yet are nearly glabrous in the inflorescence. They are thus intermediate to var. macrosperma.

Other intermediates also exist. Some from Whitehorse and B.C. have the pubescence as described above for the Maple Creek sheet but the siliques and pedicels are somewhat shorter, which makes them intermediate to D. pinnata and especially to its var. glabra (Woot. & Standl.) stat. n., Sophia glabra Woot. & Standl., Contr. U.S. Nat. Herb. 16: 127. 1913, in which the siliques are only 5-8 mm long.

3. D. pinnata (Walter) Britton var. brachycarpa (Rich.) Fern. (Sisymbrium canescens AA.; Sophia brachycarpa (Rich.) Rydb.; S. filipes AA.) -- Tansy-Mustard -- Leaves, stem and rachis of the inflorescence lightly to densely glandular-puberulent. Pedicels 6-15 mm long and widely divergent. Siliques nearly erect and about as long as its pedicel. Summer. Open soils; common weed throughout the prairie regions. -- Mack, sQ-Alta-(BC), US -- Var. filipes (Gray) M.E. Peck (ssp. intermedia (Rydb.) Detling; D. Richardsonii (Sweet) O.E. Schultz var. viscosa (Rydb.) O.E. Schultz) -- Leaves entirely or mainly stellate-puberulent; stem usually stellate-puberulent below, becoming glandular-pubescent into the inflorescence. Common from Edmonton area westward, local eastward -- Q-O, cS-BC, US.

4. D. sophioides (Fischer) O.E. Schultz -- Rachis of the inflorescence not elongating until the siliques are fully grown, thus the young siliques surround the flower-cluster and overtop it by most of their length. Otherwise much as D. Sophia, but greener, glandular, and the falcate siliques irregularly spreading to nearly erect. Mid summer. Dry gravels northward. -- F, Mack-Aka, nMan, BC, (Eur).

9. ERUCA Adanson

Like Brassica, with a terete siliques ending in a long indehiscent beak, but said beak very flat.

1. E. SATIVA Miller var. SATIVA (E. versicaria AA.) -- Rocket (Roquette) -- Petals large and veiny, like those of Raphanus. Annual, somewhat fleshy, slightly glaucous and nearly

glabrous. Calyx about as long as the claw, the claw slightly longer than the blade of the petal, the latter about 1 cm long, white to yellowish and sharply veined in purple. Summer. Rare impurity in seed or exceptional escape. -- Q-O, S, US, SA, Eur.

Groh 1946 reports this species as first appearing in Saskatchewan in 1908, in Alberta in 1910 and in Manitoba in 1911, citing however only one substantiating collection, from Grenfell in 1908. This single sheet is still the only specimen from our area at DAO. A fair amount of correspondence has survived dated around 1910 and relating to specimens sent in for identification and reported on as *E. sativa* by J.W. Eastham for a series of Ontario sources, by H. Groh for a Bradwell (Sask.) and a Lacombe (Alta.) sending. Also by F. Fyles for a Carnduff (Sask.) correspondent. None of the specimens received were preserved (not an uncommon practice at the time) and all these reports remain unconfirmed to this day. Breitung 1959 mentions 3 more Saskatchewan localities. The Manitoba report remains completely unsubstantiated: no specimen, no correspondence.

10. DIPLLOTAXIS DC.

Similar to Brassica, but the seeds in two rows in each locule.

1. *D. MURALIS* (L.) DC. (f. *caulescens* Kittel) -- Skunk-Weed, Sand-Rocket. -- Petals yellow, usually drying pinkish. Plant leafy only in its lower $\frac{1}{4}$ or the leaves all basal. Leaves lyrate. Stem simple or diffusely branched from the base. Pod linear, ascending on widely divergent pedicels. Beak very short and not obviously distinct from a style. Late spring to early fall. Infrequent weed of disturbed soils. -- NS-Alta, US, Eur.

D. tenuifolia (L.) DC. was reported for Alberta by Groh 1950 on the basis of collections from Calgary, Macleod and Pincher Creek (DAO). All 3 were revised by Dr. C. Frankton to *D. muralis* on that same year.

11. ERUCASTRUM Presl.

Mid-nerve of the valve strongly proeminent, the silique thus \pm 4-angled. Otherwise as in Brassica.

1. *E. GALLICUM* (W.) O.E. Schulz -- Dog-Mustard (Fausse Roquette) -- Lowest 1-(3) siliques borne in the axil of a pinatifid leaf. Pubescent throughout, except the pedicels and siliques. Stem retrorse-strigose. Leaves large, pinnatifid, Flowers white. Siliques long linear, widely divergent. Beak short and not obviously distinct from the style. Summer and early fall. Occasional weed of disturbed soils. -- (NF), NS-BC, US, Eur.

12. BRASSICA L.

MUSTARD

One of the basic types of the family. Silique terete, the valves dehiscent, the seeds in one row in each locule.

Fruit tapered at the tip into an indehiscent beak which sometimes contains a seed.

- a. Body of the silique densely hispid 1. B. hirta
- aa. Silique glabrous to slightly retrorse-hispid.
 - b. Upper leaves rounded to cuneate at base.
 - c. Pedicels 2-7 mm long 2. B. Kaber
 - cc. 10-15 mm long at maturity 3. B. juncea
 - bb. Upper leaves deeply cordate and clasping at base 4. B. campestris

1. B. HIRTA Moench (B. alba (L.) Rabenhorst; Sinapis alba.) -- White Mustard, Charlock (Moutarde blanche, Moutarde anglaise) -- Body of the silique densely hispid and puberulent. The whole plant more or less retrorse-hispid. Pedicels mostly widely divergent. Beak of the silique obviously flattened and at least as long as the body. Summer. Rare weed: Otterburne, Cudworth, Melville, Beaverlodge. -- (G, Y), PEI-BC, US, Eur.

2. B. KABER (DC.) L.C. Wheeler (var. pinnatifida (Stokes) L.C. Wheeler, var. Schkuhriana (Rchb.) L.C. Wheeler; B. arvensis AA.; -- Mustard, Wild Mustard (Moutarde d'été) -- Somewhat retrorse-hispid in the lower half, sometimes also above, including the siliques. Pedicels stoutish and short. Silique 2-5 cm long, thin and torulose to thickish. Valves with 3 strong nerves nearly equally prominent. Beak about 1 cm long, gradually tapered, somewhat flattened, often containing one seed. Summer. Very common weed, especially in cereal crops. -- (G), sMack-Y-(Aka), L-NF-(SPM), NS-BC, US, Eur.

Specimens with bigger siliques may be called var. pinnatifida and the opposite phenotype can then be labelled var. Schkuhriana. The variation is however continuous and is often very wide on the same plant. Seems to be an arbitrary distinction.

3. B. JUNCEA (L.) Cosson -- Indian Mustard, Chinese Mustard -- Similar to the preceeding but glabrous to slightly retrorse-hispid below. Often slightly glaucous. Pedicels thinner and longer. Siliques 2-5 cm long. Valves with only one strong mid-nerve. Beak abruptly contracted at base, seedless and nearly terete. Summer. Common weed of cultivation. -- Mack, (Aka), NF, (NS-NB)-Q-(O-Man)-S-BC, US, Eur.

4. B. CAMPESTRIS L. (B. Napus L.) -- Field-Mustard -- Glaucous and the pods thickish and very long, (3)-5-7-(10) cm long, including the beak 0.6-1.5 cm long. Glabrous or slightly setulose-hispid below. Leaves thickish, the lower lyrate with a very large terminal lobe, the upper much smaller and usually entire, deeply cordate and clasping, largest near the base. Pedicels long, divergent to spreading. Beak usually containing one seed. Summer. Casual weed of crops roadsides and fields.-- (G), sMack-Aka, L-NF, NS-BC, US, CA, SA, Eur.

Two races occur. They may be identified by their pollen size, but are not otherwise readily recognizable in the herbarium except in their extreme forms. Specimens with small petals, less than 10 mm long, or long beaks, at least 14 mm long and at

least $\frac{1}{3}$ the length of the valves may be referred to B. campestris proper. Those with short beaks, less than 10 mm and less than $\frac{1}{4}$ the length of the valves may be named B. Napus. The latter is known as a weed from Brandon, Saskatoon, etc.

13. RAPHANUS L.

RADISH

Fruit divided into two parts; the lower reduced and seedless or abortive; the upper large and seed-bearing, the seeds separated by transversal partitions. Fruit constricted at the level of the partitions.

1. R. RAPHANISTRUM L. var. RAPHANISTRUM -- Wild Radish, Jointed Charlock (Rave sauvage, Ravenelle) -- Fruit large and thick, 3-7 cm long, becoming moniliform in drying, breaking up into a series of strongly ribbed articles. Root thin. Petals 1-3 cm long, variable in colour. Silique with 1-8 one-seeded articles. Beak 1.5-2.5 cm long, rather cylindric. Summer and early fall. Rare and evanescent weed of cereal crops: Tisdale, Two Hills. -- G, L-SPM, NS-O, S-(Alta)-BC, US, Eur -- Var. SATIVUS (L.) Beck -- Radish (Rave, Radis) -- Root thin or inflated into a Radish. Fruit shorter, 2-5 cm long, fleshier, not moniliform nor ribbed in drying, not disarticulating at maturity. Beak coarse and conical, usually about as long as the body of the silique. Summer and fall. Cultivated and infrequently reseeding itself in loose soil for a year or two; rarely as a weed in crops. -- (G, Aka), NS, NB-Man, BC, (US, Eur).

14. RAPISTRUM Crantz

Silique divided transversally into two segments and breaking up at the partition. Lower segment short-cylindric; upper segment subglobular, apiculate, strongly ribbed, one-seeded, indehiscent.

1. R. PERENNE (L.) All. (Raphanistrum perenne sphalm.) -- Fruit clavate, the dilated half with 8 very strong ribs. Stiffly hirsute below. Leaves pinnatifid. Silique about 1 cm long, glabrous. First half of summer. Very local weed of field crops: Grenfell, Broadview. -- S, Eur.

15. BARBAREA Br.

WINTER CRESS

Like Rorippa, but the silique elongate and narrow, so that the seeds are crowded into a single row.

1. B. vulgaris Br. (B. americana Rydb.; B. orthoceras Led.; B. stricta Andr.) -- Wintercress, Yellow Rocket (Cresson de terre, Cresson d'hiver) -- In ditches and other wet places, a very conspicuous yellow-flowered. Crucifer in late spring and very early summer. Stiffly erect biennial. Leaves clasping at base, pinnatifid to pinnatipartite, the terminal lobe much the larger. Flowers pale yellow. Siliques divergent to nearly appressed. Late spring to mid summer. Shores and wet, open places.

ces; sometimes weedy. -- (G), Mack-Aka, L-SPM, NS-BC, US, Eur.

Variable, especially the silique, but we fail to detect anything of interest in the proposed segregates. Most commonly American authors will distinguish an introduced *B. vulgaris* with larger flowers and a longer beak to the silique, as against a native *B. orthoceras*. European authors make a parallel distinction between a *B. vulgaris* and a *B. stricta* (or *B. intermedia* Boreau) the latter with smaller flowers and shorter beak. These have never appeared to us as patently distinct populations in the field, while in the herbarium they are part of a morphological continuum. We remain unconvinced, hence the consolidation.

16. RORIPPA Scop.

A basic type, somewhat heterogeneous, with yellow flowers. Pubescence lacking or of simple hairs. Fruit short to elongate, commonly a silicle, but sometimes a typical silique, nearly terete, the seeds in two rows in each locule. Leaves usually pinnately and deeply lobed.

The following treatment takes into account an unpublished monograph by R.L. Stuckey dated 1965.

- a. Main stem-leaves entire to merely serrate.
 - b. Petals longer than the sepals; silicle 1.0-1.5 mm long 2. *R. austriaca*
 - bb. Shorter than the sepals; silicle longer and ± cylindrical 5. *R. curvipes*
- aa. Deeply lobed.
 - c. Fruit a typical and elongate silique, much longer than its pedicel 7. *R. Nasturtium-aquaticum*
 - cc. Fruit a silicle or a short silique on a long pedicel.
 - d. Biennial or annual; petals 1-2 mm long.
 - e. Pedicel 1.5-3.0 mm long 4. *R. tenerrima*
 - ee. Longer 6. *R. islandica*
 - dd. Perennial; petals much longer.
 - f. Style at least 1 mm long 3. *R. sinuata*
 - ff. Not exceeding 1 mm 1. *R. sylvestris*

1. *R. SYLVESTRIS* (L.) Besser -- Water-Rocket (Herbe à l'oe) -- Silique very thin, less than 1 mm wide. 1.0-1.5 cm long and borne on a pedicel nearly as long. Glabrous or puberulent perennial. Leaves pinnatipartite. Style 0.5-1.0 mm long. Summer. Rare garden weed. -- (G, NF, NS-NB)-Q-(O)-Man-BC, (US, Eur).

Known to us only from Morden, Regina, Olds and Banff. All DAO.

2. *R. AUSTRIACA* (Crantz) Besser -- Leaves merely serrate, lanceolate. Glabrous perennial. Pedicels many times as long as the small fruit. Silicle ovoid to oblong, 1.0-1.5 mm long, the style about 1 mm long. Early summer. Rare weed of roadsides and cultivated fields: Pilot Mound, Greenstreet, Ft.

Sask. -- Man-Alta, US, Eur.

3. R. sinuata (Nutt.) Hitchc. (R. columbiae AA.) -- Rather similar to R. sylvestris, but the silique larger and the inflorescence, including the fruits, puberulent with small vesicular hairs similar to those of Chenopodium. Pedicel about as long as the fruit. Silique 6-10 mm long, 1-2 mm wide. Style 1-2 mm long. Late spring to early fall. Rare on shores, infrequent as a weed. -- (O), sS-Alta, US.

4. R. tenerrima Greene (R. obtusa AA.) -- Like R. islandica with the silicle usually smaller and on a shorter pedicel, (1.5)-2.0-2.5-(3.0) mm long. Glabrous or the silicle minutely vesicular like last. Petals very small, about 1 mm long. Fruit longer than its pedicel. Summer. Wet ground. -- (Mack), swAlta-BC, US.

We have checked specimens from Del Bonita (DAO), Sage Creek (CAN), Calgary (TRT) and Kamloops (DAO). Otherwise nearly all specimens found under R. obtusa at DAO and MTJB have been revised to R. islandica. We do not know to what extent other herbaria need to be similarly reviewed.

An Alaska report by Hultén 1950 was based on a specimen revised to R. curvisiliqua by Stuckey.

5. R. curvipes Greene -- Pedicels often strongly recurved. Leaves entire to merely serrate, oblong to oblanceolate. Inflorescence often secund. Pedicels ascending to recurved, mostly 2-5 mm long, mostly about as long as the silicle, the latter glabrous. Petals as short or shorter than the last. (Late spring and summer?). Wet ground. -- (S-BC, US).

Reported by Stuckey from Caron, Craigmyle, Crow's Nest, Rosedale and Milk River.

6. R. islandica (Oeder) Borbas (var. Fernaldiana Butters & Abbe, var. hispida (Desv.) Butters & Abbe; R. hispida (Desv.) Britton; R. curvisiliqua AA.; R. palustris (L.) Besser; Radicula palustris (L.) Moench, var. hispida (Desv.) Rob.) -- Watercress, Marsh-Cress (Cresson de marais) -- Petals small, 1.5-2.0 mm long. Highly variable annual or biennial plant. Glabrous to hispid. Leaves pinnatifid with a much larger terminal segment. Fruit exceedingly variable, commonly a fat, oblong silicle, about as long as its pedicel. Summer. Wet places, sometimes weedy. -- G, (seK)-Mack-Aka, L-(NF), NS-BC, US, (CA, Eur).

The collection Maccoun, Indian Head, 1895 (DAO) was reported as R. curvisiliqua (Hooker) Bessey by Russell 1954 and as R. sinuata by Breitung 1957. We have revised it to R. islandica.

We are not yet convinced that any of the proposed segregates represents a taxonomically significant entity.

7. R. NASTURTIUM-AQUATICUM (L.) Hayek var. NASTURTIUM-AQUATICUM -- (Nasturtium officinale Br.; Radicula Nasturtium-aquaticum (L.) Britten & Rendle) -- Watercress (Cresson, Cresson de fontaine) -- Siliques more elongate, (1.2)-1.5-(1.8) cm long and \pm falcate. Leaves seemingly pinnate. Segments mostly 5-9, oblong to suborbicular, the terminal one slightly larger. Stems reclining, soft and weak. Flowers whitish. First half of summer. Creeks and springy places. Rarely cultivated, locally

naturalized at Banff and Pincher Creek. -- NS, sQ-O, swAlta-BC, US, CA, (SA), Eur -- Var. LONGISILIQUA (Th. Irmisch) Boivin (Nasturtium microphyllum (Boenn.) Rchb.) -- Siliques more elongate, 1.5-2.5 cm long. Well established at Aweme. -- NF, PEI-sMan, BC, US, Eur, (Afr) -- X. Var. STERILIS (Airy-Shaw) Boivin -- Sterile. Pollen essentially sterile; ovaries not ripening into fruits. An introduced hybrid of our two varieties, known locally at Banff. -- NS, Alta, (US), Eur.

An earlier report of Nasturtium officinale from Manitoba was based on a Rorippa and was discounted by Scoggan in 1957.

Aweme (or Shilo) where we found var. longisiliqua in 1951 and 1959 is an old settlement on the sandy Agassiz deltaic deposits near the junction of the Souris and the Assiniboine. It is now a nearly deserted locality, and not readily identified on modern maps. But it remains well known in biological annals because of the multifarious scientific activities of the many members of the famous Criddle family.

17. ARMORACIA Gaertner, Meyer & Scherbius

Very close to Rorippa; the fruit a silicle, but the flowers white.

1. A. RUSTICANA G., M. & S. (A. lapathifolia Gilibert; Radicula Armoracia (L.) Rob.; Roripa Armoracia (L.) Hitchc.) -- Horseradish (Raifort, Moutarde des Capucins) -- With very large basal leaves on long petioles; the limb (1)-2-3-(5) dm long, ± lanceolate and dentate. Stem about 1 m high. Lower leaves ± pinnatifid; upper leaves ± lanceolate and merely dentate. Inflorescence large and showy. Silicle small, obovoid. Early summer. Cultivated and persisting, sometimes spreading to ditches and roadsides. -- (NS)-PEI-(NB)-Q-BC, US, Eur.

An extension of range to Alaska by Hultén 1945 was probably based on cultivated material since it was based on a collection by Anderson and is not mentioned in the latter's flora.

18. CARDAMINE L.

BITTER CRESS

Somewhat similar to Arabis, but the valves elastic and thus becoming spirally coiled upon dehiscence. Glabrous or with simple hairs. Leaves mostly deeply divided to pinnate. Flowers white to purple. Silique thin and long.

- a. Stem leaves entire to coarsely toothed.
 - b. Entire 1. C. bellidifolia
 - bb. Coarsely toothed 2. C. bulbosa
- aa. Stem leaves deeply divided to pinnate.
 - c. Flowers large, the petals 8-13 mm long 3. C. pratensis
 - cc. Flowers clearly smaller.
 - d. Stem pubescent below 5. C. scutata
 - dd. Stem glabrous below.
 - e. Stem leaves with oblanceolate to linear leaflets 6. C. parviflora

ee. Leaflets larger, the terminal one
elliptic to reniform 4. C. oligosperma

1. C. bellidifolia L. -- Small tufted alpine perennial with entire, ovate leaves. Only 2-10 cm high. Racemes few-flowered, often maturing only 1-3 siliques. Early summer. Rocky alpine slopes and shale slides. -- G-Aka, L, nQ, swAlta-BC, US, Eur.

2. C. bulbosa (Schreber) BSP. -- Spring-Cress -- Perennial from a fleshy bulb. Leaves reniform to lanceolate, mostly coarsely toothed. Stem solitary, usually simple with a terminal raceme of fairly showy flowers. Mid spring. Wet ground, uncommon. -- swQ-seMan, US.

3. C. pratensis L. var. angustifolia Hooker (var. palustris Wimm. & Graebn.) -- Mayflower, Lady's Smock (Fleur du tonnerre, Chasseraige) -- Leaflets of the stem-leaves narrow and all alike, not or little decumbent, entire, usually petiolate. Basal leaves often with round leaflets, all alike. Stem nearly always simple with a showy raceme of white to pink flowers. First half of summer. Wet and boggy places. -- G-Aka, L-SPM, Q-BC, US, Eur.

Grades into the more northern var. pratensis in which the leaflets are somewhat coarsely toothed, or at least the basal leaves have a three-toothed terminal leaflet.

4. C. oligosperma Nutt. var. kamtschatica (O.E. Schulz) Detling (C. umbellata Greene) -- Inflorescence short, the rachis mostly 1-2 cm long only. Stem simple or slightly branched. Basal leaves many, mostly with suborbicular leaflets, the terminal one much larger and trilobed to crenate. Stem leaves fewer, with narrower and longer leaflets. Early to mid summer. Mountain creeks. -- Y-Aka, swAlta-BC, (US, Eur).

In the more western var. oligosperma the inflorescence elongates and the rachis is usually over 3 cm long. In our more widespread variety the raceme is more condensed, often subumbellate.

5. C. scutata Thunb. (C. pensylvanica Muhl.) -- Bitter Cress -- More or less hispid below the middle, or exceptionally glabrous when submerged earlier. Commonly, the stem rather branchy. Leaflets variable, the larger lateral ones 3-10 mm wide, decurrent on the proximal side, usually toothed, the terminal one larger. Fruiting racemes ± secund on the lateral branches. Flowers small, the petals 2-4 mm long. Style at least 0.5 mm long. Late spring and early summer. Wet soils, usually near streams. -- (sMack-Aka), NF-SPM, NS-(PEI-NB)-Q-BC, US, Eur.

Our C. pensylvanica is not obviously different from the asiatic C. scutata, as pointed out to us by a visiting Japanese botanist.

6. C. parviflora L. (var. arenicola (Britton) O.E. Schulz) -- Similar to the preceding, but glabrous throughout. Annual or biennial. Leaflets smaller, 1-3 mm wide, rather all similar, not decurrent and usually entire. Racemes not secund, the branches being incurved. Style short, often less than 0.5 mm. Early

summer. Dry, rocky outcrops, sometimes weedy. -- Mack, (NS, NB) -Q-seMan, Alta-(BC), US, Eur.

American plants, var. arenicola, are supposed to differ somewhat from the eurasian phase, but our specimens do not conform to the differences as expressed in the floras consulted.

19. PHYSARIA Gray

Like Lesquerella, but the silicle greatly inflated into a pair of bladders fused to the much narrower septum.

1. P. didymocarpa (Hooker) Gray var. didymocarpa -- Twin-Pod -- Small alpine perennial with a big and deep tap-root. Stellate-pubescent throughout. The inflated pod perhaps 1 cm across. Style becoming 5-10 mm long in fruit. Early summer. Alpine prairies and screes. -- swAlta- (seBC, US).

Various other varieties are recognized further south, including a larger fruited var. lyrata C.L. Hitchc.

20. LESQUERELLA Watson

A basic type with silicles and yellow flowers. Stellate-pubescent. Pod neither flattened nor greatly inflated, dehiscent at maturity. Stem-leaves entire or nearly so, cuneate at base.

a. Pedicels recurved in fruit 2. L. ludoviciana
aa. Pedicels ascending.

b. Pod globose or depressed-globose 1. L. arctica

bb. Pod elongate, ovoid to narrowly ellipsoid 3. L. alpina

1. L. arctica (Wormsk.) Watson var. arctica -- Much like the following, however the pedicels not recurved but ascending and usually straight, or slightly sigmoid. Flowers yellow. Pod glabrous. First half of summer. Loose gravels and sandy beaches: Churchill. -- G-Mack, Aka, (L)-NF, Q, nMan, nBC, (Eur)-- -- Var. Purshii Watson (L. Purshii (Watson) Fern.) -- Pods minutely white-dotted with stellate hairs. -- F, Mack-Aka, NF, seQ, swAlta-nBC.

The Alberta mention of L. arctica by Macoun 1898 was based on a Spreadborough collection from Lake Brulé (CAN; DAO, photo) in Alberta. In 1937 this specimen was correctly revised by Dr. A.E. Porsild to var. Purshii.

Our two varieties have largely coincident distributions in the overall picture, but not so within our area. The type with the stellate pods is the usual one in the Rockies and around the Gulf of Saint Lawrence; elsewhere the glabrous pod is dominant.

Other classifications have been proposed, including one in which our plant is subdivided into 2 species disjunct by some 400 miles. But to achieve this, many of our specimens would have to be identified by placing the emphasis now on one character, now on another, according to their place of origin and in relation to a preconceived distributional pattern.

2. L. ludoviciana (Nutt.) Watson var. arenosa (Rich.) Watson (L. arenosa (Rich.) Rydb.; L. argentea AA.) -- An inconspicuous species of dry hills with racemes of recurved pedicels becoming readily entangled. Perennial with numerous widely spreading stems 0.5-2.0 dm long. Densely stellate-pubescent. The yellow petals often red-tinged. Pod globular. Very early spring to early summer. Dry or eroded hills and sandy soils in the prairie region. -- Man-Alta, cnUS.

Grades further south into a var. ludoviciana with more erect and longer stems, petals yellow and the racemes little, if at all, secund.

3. L. alpina (Nutt.) Watson var. alpina (var. spatulata (Rydb.) Payson; L. spatulata Rydb.) -- Pod elongate. Similar to the preceding, but more erect, flowers yellow and the pods erect on ascending or more commonly sigmoid pedicels. Style about half as long as the pod. Late spring and early summer. Badlands. -- swS-sAlta, US.

In our variety the stem normally elongates in flower and fruit until it is many times taller than the rosette leaves. A more southern type, var. condensata (Nelson) C.L. Hitchc. is shorter, the rosette leaves often overtopping the inflorescence or nearly so.

21. HUTCHINSIA Br.

Silicle compressed laterally, but only slightly so and the stigma sessile. Flowers white. A rather small and unspecialized type.

1. H. procumbens (L.) Desv. -- Small and insignificant plant, annual and less than 2 dm high. Leaves few, small, entire, or the lower sometimes pinnatifid. Petals and sepals about 1 mm long. Pod 1.5-3.5 mm long, obovate to oblong. Late spring to early summer. Shores. -- L-NF, nMan-S-(Alta)-BC, US, Eur.

Unaccountably very rare and very sporadic. Or perhaps maybe too small and easily overlooked. For our area we have examined specimens from Churchill, Parkberg and Little Inglebright.

22. CAPSELLA Med.

SHEPHERD'S PURSE

Silicle strongly flattened laterally and obdeltoid.

1. CAPSELLA BURSA-PASTORIS (L.) Med. -- Pick-Pocket, Shepherd's Purse (Tabouret, Corne de lion) -- The very flat silicle obdeltoid to obtriangular or somewhat obcordate. Basal leaves pinnatifid. Stem-leaves mostly entire. All summer. Common weed of disturbed ground. -- G-F, Mack-Aka, L-SPM, NS-BC, US, (SA), Eur, (Oc).

23. CAMELINA Crantz

FALSE FLAX

Similar to Lesquerella, but the silicle flattened at the edge into a narrow peripheral wing.

- a. Style 1.5-2.0 mm; the body of the silicle
not more than 3 times as long as the style ..
..... 3. C. microcarpa
- aa. Style shorter, 0.5-1.5 mm long, but the
body of the silicle longer.
b. Seed nearly twice as long as wide 1. C. sativa
bb. Seed about as wide as long 2. C. Parodii

1. C. SATIVA (L.) Crantz -- Dutch Flax, False Flax (Sésame d'Allemagne, Sésame bâlard) -- Similar to the more common C. microcarpa, but the fruit larger and the pubescence essentially of stellate hairs. Body of the pod 6-10 mm long, obovoid, ± stipitate. Style 0.5-1.5 long on the mature pod. Seed about 1 mm wide, nearly twice as long. Summer and early fall. Casual weed of disturbed soils. -- Mack, (Aka), NS, Q-BC, (US), Eur.

2. C. PARODII Ibarra & La Porte (C. dentata AA.) -- Nearly identical to the preceeding and perhaps only varietally distinct. Seed larger, 2 X 2 mm. Body of the pod 5-6 mm long, nearly as wide as long, truncate at tip, the stipe indistinct. Late spring and early summer. Rare weed. --sMan-sAlta, (US, SA).

This has appeared from time to time in cribbings from the Prairie Provinces and our knowledge of its distribution is mainly from this source. We know of actual specimens from only Arborg, Winnipeg and Aden. The Saskatchewan report rests solely on an envelope of cribbings from Delisle (DAO). Earlier reports from Swift Current were apparently based on a cultivated specimen (DAO).

3. C. MICROCARPA Andrz. -- Annual weed with obovoid and short-stipitate pods in lax racemes. Leaves entire, sagittate at base. Pubescence mixed, of small, stellate hairs and much longer hirsute hairs. Body of the silicle 3-6 mm long, obovoid, substipitate. Style 1.5-2.0 long on the mature pod. Seeds about 1 mm long, slightly narrower. Late spring to mid fall. Frequent weed of disturbed soils. -- NF, NS-BC, US, Eur.

24. NESLIA Desv.

BALL MUSTARD

Silicle indehiscent, nearly globular and slightly flattened parallel to the septum.

1. N. PANICULATA (L.) Desv. var. PANICULATA -- Ball-Mustard -- A yellow-flowered weed with long racemes of small, nearly globular and indehiscent fruits. Annual, stellate-pubescent, often simple or nearly so. Pod about 2 mm wide, reticulate-rugose. Early summer to early fall. Frequent weed of disturbed soils. -- Mack-Y-(Aka), NF, NS-BC, (US), Eur, Afr.

The valve of the pod, in the typical phase, lacks a mid-nerve. In southern Europe and the Near East it grades into a var. apiculata (F., M. & L.) stat. n., N. apiculata F., M. & L., Ind. Sem. Hort. Petr. 8: 68. 1842 with valves showing a well

defined midnerve, barely sinuous, continuous from base to summit, and more strongly rugose than the lateral nerves.

25. DRABA L.

Similar to *Arabis*, but the fruit shorter. A basic type with a typical silicle strongly compressed parallel to the septum. Flowers white or yellow. Hairs of 4 main types. Simple, forked, branched and stellate. Branched hairs have the branches spreading in all directions. Stellate hairs are lower, nearly sessile, with the branches parallel to the leaf surface and radiating from a central point.

- a. Stem leafless, or sometimes with a single small leaf Group A
- aa. Stem leafy Group B

Group A

Stem scapose.

- a. Annual; inflorescence very short and the pods 1.0-1.5 cm long 17. D. reptans
- aa. Perennial; inflorescence elongate and/or the silicles shorter.
 - b. Flowers yellow, sometimes fading white.
 - c. Leaves glabrous or somewhat ciliate towards the tip 4. D. crassifolia
 - cc. Leaves more or less pubescent, at least on the back.
 - d. Stem glabrous 6. D. oligosperma
 - dd. Stem pubescent.
 - e. Low plant with narrow leaves, averaging 1 mm wide 1. D. stenopetala
 - ee. Taller and the leaves wider, all or mostly 1.5-4.0 mm wide.
 - f. Leaves pilose to branched-pubescent 2. D. alpina
 - ff. Leaves stellate-pubescent dorsally 7. D. incerta
 - bb. Flowers white.
 - g. Leaves not ciliate, but densely and finely stellate throughout 5. D. nivalis
 - gg. Long ciliate.
 - h. Densely stellate-pubescent throughout, including the silicles 12. D. cinerea
 - hh. Less pubescent, at least the silicles and stem glabrous or at the most pubescent near the base only.
 - i. Leaves glabrous, at least on back 4. D. crassifolia
 - ii. Leaves more or less pubescent dorsally 3. D. fladnizensis

Group B

Stems leafy.

- a. Stem leaves all or mostly opposite 17. D. reptans
- aa. Alternate.
 - b. Flowers yellow.
 - c. Stem-leaves 1-5.
 - d. Pedicel $\frac{1}{2}$ as long to slightly longer than the silicle 15. D. stenoloba
 - dd. Pedicel longer, $1\frac{1}{2}$ to 4 times as long as the silicle 16. D. nemorosa
 - cc. Stem-leaves more numerous, commonly 10-15 8. D. aurea
 - bb. Flowers white.
 - e. Stem-leaves numerous, 6-25 per stem; biennial 9. D. incana
 - ee. The stem less leafy; mostly perennial species.
 - f. Silicle glabrous.
 - g. Perennial; pedicels narrowly divergent 10. D. hirta
 - gg. Biennial; pedicels widely divergent 15. D. stenoloba
 - ff. Silicle pubescent.
 - h. Leaves somewhat long-ciliate towards the base; usually with only 1 stem leaf 12. D. cinerea
 - hh. Not long-ciliate, merely stellate along the edge; stem leaves commonly 3-5.
 - i. Plant stellate-pubescent throughout, including the silicles 13. D. lanceolata
 - ii. Fruit pubescence of simple hairs only, or in part bifurcate; stem long pilose towards the base.
 - j. Perennial with broadly lanceolate pods about 3mm wide 9. D. McCallae
 - jj. Biennial with linear pods about 2 mm wide ..
..... 14. D. praealta

1. D. stenopetala Trautv. var. stenopetala (D. densifolia AA.; D. Paysonii var. Treleasii (O.E.S.) C.L.H.) -- Small alpine perennial, densely pulvinate, the branches of the caudex densely covered with a sheath of marcescent leaves. Scape up to 5 cm high. Branched-pubescent. Leaves broadly linear, up to 5 mm long and 1 mm wide, abundantly long-ciliate, somewhat pubescent with tangled hairs. Pod ovate. Early summer. Alpine shale slides. -- (Aka), swAlta-BC, US, Eur.

It would appear that earlier Canadian reports of D. densifolia were based on specimens of other species, mostly D. stenopetala. However the B.C. report by Taylor 1966 seems justified as it is presumably based on a correctly identified sheet from Sage Creek (DAO, and probably also at UBC).

Our typical variety has pods 2-5 mm long and styles 0.5-0.8 mm long. In the southern Rockies it grades into a var. Paysonii (Macbr.) stat. n., D. Paysonii Macbr., Contr. Gr. Herb. 56: 52, 1918 with bigger pods, 5-8 mm long, and longer style, ± 1 mm.

Hultén 1945 points out the similarity of the siberian D. stenopetala with the american D. densifolia Nutt. Actually, by its smaller and more pubescent leaves and its small pod, D. stenopetala is closer to one of the segregates of D. densifolia, namely D. Paysonii, hence the nomenclature followed here. D. stenopetala is the earlier name by nearly 40 years for our Rocky Mountain plant.

2. D. alpina L. (var. Hydeana Boivin) -- Large scapose species with rather large pods and leaves, the flowers yellow. Leaves usually 3-5 mm wide, mostly oblanceolate, long-ciliate and pubescent, at least dorsally, with simple or forked or, usually, branched hairs. Mostly 1.0-1.5 dm high. Petals yellow, 4-5 mm long. Silicle very variable, commonly ovate to oblong and 4-5 mm wide, often purplish. Early summer. Open and rocky places in arctic tundra. -- (G)-F-Mack-(Y)-Aka, L, nQ-(O)-nMan, Eur.

Reports from Alberta and B.C. proved to be all based on other species and specimens found under that name in various herbaria have all been revised to other entities such as D. incerta, etc.

3. D. fladnizensis Wulfén var. heterotricha (Lindblom) Ball (D. lactea Adams) -- Resembling D. alpina, but smaller, the flowers white and the stem glabrous above the base. Leaves branched-pubescent dorsally, long ciliate, the cilia often forked or branched. Petals sometimes fading yellowish. Style short. Early summer. Wet sands and gravels in the arctic. -- (G)-F-K-(Mack-Y)-Aka, L, Q, nMan, (swAlta-BC), Eur.

All Manitoba collections were atypical, the leaves being glabrous dorsally, but abundantly ciliate with stellate hairs.

In the typical phase found in Eurasia and the northwest of us, the leaf pubescence is of simple hairs only, while they are dimorphic in our variety being stellate dorsally and simple or bifurcate marginally.

4. D. crassifolia Graham var. crassifolia (D. albertina Greene; D. Parryi Rydb.) -- Glabrous or nearly so and the leaves slightly fleshy. Otherwise quite similar to the preceding. Up to 1 dm high. Stigma sessile or very nearly so. Early summer. Alpine ridges and gravels. -- (G)-F-K-(Mack)-Y-(Aka, L), Q, swAlta-BC, US, Eur.

In the more southern and nevadan var. nevadensis C.L. Hitchc. the stem and inflorescence are pubescent.

5. D. nivalis Lilj. var. nivalis -- A small perennial species with the leaves densely and finely stellate-pubescent, not

ciliate. Flowers white. Scape mostly about 5 cm high. Silicle \pm lanceolate, flat to slightly twisted, less than 1 cm long. Early summer. Rocky outcrops north of or above timberline. -- G-Mack-(Y)-Aka, (L-NF), Q-nMan, swAlta-BC, (US), Eur -- Var. elongata Watson (D. lonchocarpa Rydb.) -- Fruit longest and most twisted. Silicle 1.0-1.5 cm long, linear, twisted by $\frac{1}{2}$ to $1\frac{1}{2}$ turns. -- (Y-Aka), swAlta-BC, (US).

6. D. oligosperma Hooker var. oligosperma -- Resembling D. stenopetala by its marcescent leaves forming a dense sheath around the branches of the caudex, but the scape glabrous and the leaves appressed-stellate-pubescent. Scapes 1-6 cm high. Leaves linguiform, 1 mm wide or less, the pubescence not very abundant and all of stellate hairs. Silicle \pm ovate. Spring. Dry rocky slopes, usually below timberline. -- (Mack-Aka), swAlta-BC, US.

The last monograph recognizes a diminutive phase known from California as var. subsessilis (Watson) Schulz.

7. D. incerta Payson -- Much as D. alpina, but the leaves stellate-pubescent dorsally. More loosely tufted. Scape pubescent. Leaves often narrower, commonly 1.5-2.5 mm wide and oblanceolate. Silicle green, \pm 3 mm wide and most often broadly lanceolate. Spring and early summer. Shale slopes above timberline. -- (Mack), swAlta-BC, wUS.

8. D. aurea Vahl. var aurea (D. minganensis (Vict.) Fern.) -- The stem very leafy like D. incana, but the flowers yellow and usually a short-lived perennial. Stellate-pubescent throughout, the stem also somewhat pilose. Pod lanceolate, slightly twisted, puberulent, the hairs often simple, short and reflexed. First half of summer. Subarctic or subalpine, on gravelly or sandy shores and cliffs, especially if disturbed. -- (G), K, (Y-Aka), L, Q-BC, US -- Var. leiocarpa (Payson & St. John) C.L. Hitchc. -- Silicle glabrous. -- (Alta)-BC, (US).

9. D. McCallae Rydb. -- Closer to the last by its pubescence, but more similar to D. hirta by its habit. Herbage stellate-puberulent throughout but the stem long pilose below. Stellate hairs with simple branches. Stem leaves (3)-5-(12). Flowers white, fading yellowish. Silicle (7)-8-10-(12) mm long, (2)-3-(4) mm wide, narrowly oblong to lanceolate, densely puberulent with simple and somewhat ascending hairs. Early summer. Alpine gravels and talus slopes. -- swAlta-neBC.

10. D. incana L. (var. confusa (Ehrh.) Lilj.) -- Very leafy biennial. 1-4 dm high. Stem and leaves densely pubescent, the pubescence mixed, part stellate, part pilose. First year rosette very dense, hemispherical, marcescent. Leaves numerous, dentate. Flowers white. Pod lanceolate, slightly twisted. Mid summer. Usually on gravel, especially if disturbed. -- G, K, L-SPM, PEI, Q-nMan, (US), Eur.

Macoun and other older authors were wont to use this name in the sense of D. hirta, but his report of 1883 from the Bow River Pass turned out to be based on a specimen of D. aurea (CAN; DAO, photo). The numerous Manitoba reports proved to be all based on misidentifications except those from Churchill.

The Bell collection from York Factory in 1880 (QK; DAO, photo) was a D. hirta, while his Churchill River collection of 1879 (QK; DAO, photo) is more accurately referred to D. lanceolata. Similarly, Macoun's reports from B.C. were also based on specimens of other white-flowered species, including D. lanceolata.

11. D. hirta L. var. hirta (D. arabisans Mx.; D. dahurica sphalm.; D. daurica DC.; D. glabella Pursh) -- A middling species with white flowers and leafy stem. Perennial. Leaves dentate, the stem ones usually 3-5. Stellate-pubescent throughout, except the glabrous pods. Hairs doubly stellate, some of the primary branches being minutely branched toward the tip. Stems 1-4 dm high. Silicle about 1 cm long, lanceolate, flat to slightly twisted. Early summer. Dry cliffs and gravels. -- G-Mack-(Y)-Aka, L-NF-(SPM), NS, NB-Man, (BC), US, Eur.

We can detect no substantial difference between D. arabisans, D. daurica and D. glabella. And D. arabisans is the earliest name. But we have used the still earlier D. hirta, a name discarded by most authors because of past misuse, abuse and confusion.

Two other varieties occur around the Gulf of Saint Lawrence, a var. laurentiana (Fern.) Boivin with the stem pubescence mixed with longer and simple hairs towards the base, and a var. pycnosperma (Fern. & Knowlt.) Boivin with shorter and fleshy pods.

12. D. cinerea Adams -- Intermediate between the scapose and leafy species, the stem usually bearing only 1 leaf. Fruiting stems about 1 dm high. Densely stellate-puberulent throughout, and pubescent on the leaf faces and pods with doubly stellate hairs, like the last, the leaves also long-ciliate below the middle. Leaves 1-4 mm wide, ovate to oblanceolate. Flowers white, often drying yellow. Early summer. Silicles oblong to lanceolate. Sandy or gravelly shores and banks. -- G-(F)-K-Mack-(Y-Aka), Q-nO, nWS-swAlta-(nBC), Eur.

The only reported Manitoba collection, E. Beckett 184a, Churchill, Aug. 1, 1953 (CAN; DAO, photo) has been revised to D. lanceolata.

13. D. lanceolata Royle -- Silicles pubescent with partly stellate hairs. Otherwise pretty much like a smaller D. hirta and perhaps of debatable value. Early summer. Dry gravels and cliffs. -- G, seK, Y-(Aka), L, NB-Q-(O)-nMan-nS-swAlta-BC, US, Eur.

14. D. praealta Greene -- Siliques elongate and \pm linear like the next, but pubescent and the flowers white. Biennial, pubescent throughout and often much branched below. Pedicels about half as long as the siliques, the latter erect and mostly 1.0-1.5 cm long. Mid spring to early summer. Open rocky places -- Mack-(Y), swAlta-BC, US.

15. D. stenoloba Led. var. stenoloba -- Flowers yellow, often lightly pink-tinged near the tip. Biennial plant, glabrous above the middle, lightly stellate-pubescent below, including the leaves. Stem leaves few. Siliques erect, lanceolate to linear, about as long as the widely divergent pedicels.

Early to mid summer. Subalpine to alpine slopes. -- (Y)-Aka, swAlta-BC, (US) -- Var. nana (O.E. Schulz) C.L. Hitchc. -- Stem more coarsely pubescent, mainly pilose, the hairs spreading and mostly simple to bifurcate. Leaf pubescence tending to be similar. -- Y, swAlta-sBC, US.

Var. nana may be an essentially sympatric segregate, hence of questionable value.

16. D. nemorosa L. var. nemorosa (D. nemoralis sphalm.)-- Annual with lanceolate silicles on very long pedicels. Pilose to stellate-puberulent throughout, including the puberulent pods. Leaves variable, often rather large for the genus. Pedicels 0.7-3.0 cm in fruit. Early spring to early summer. Light soils, especially if disturbed. -- O, sS-BC, US, Eur -- Var. leiocarpa Lindblom (D. lutea Gilib.) -- Fruit glabrous. -- F, Mack-Y-(Aka), swQ-Alta-(BC), US, Eur.

17. D. reptans (Lam.) Fern. var. micrantha (Nutt.) Fern. var. stellifera (O.E. Schulz) C.L. Hitchc.; D. caroliniana Walter var. micrantha (Nutt.) Gray -- Silique elongate, like the last three, and annual, but the pedicels very short. Less than 1 dm high, tufted and easily overlooked. Leaves coarsely pubescent, all basal, or some of them borne near the base and mostly opposite. Stem naked for most of its length. Inflorescence short, its rachis shorter than the pods. Siliques strigose, 1.0-1.5 cm long, mostly 3-5 times longer than their pedicel. Early to mid spring. Sandy or gravelly prairie, especially if disturbed. -- sMan-sS-sAlta, US.

The more eastern typical phase has glabrous pods.

26. SMELOWSKIA C.A. Meyer

Resembles Draba or Eutrema, but the silicle barely compressed and strongly keeled along the midnerve of the valves.

1. S. calycina (Stephan) C.A. Meyer var. americana (Regel & Herder) Drury & Rollins -- Similar to Draba, but the leaves pinnatifid. Densely tufted perennial. Pubescent throughout, but the density variable; usually the basal leaves are whitish-stellate and the inflorescence is long villous. Stem leaves more deeply divided than the basal ones. Silicle \pm 1 cm long, narrowly oblanceolate, lightly long villous to glabrous. Early summer. Alpine rock slides and rocky ridges. -- swAlta-sBC, (US).

The more northern var. integrifolia (Seeman) Rollins has the leaves entire or merely slightly toothed.

27. THELLUNGIELLA O.E. Schulz

Similar to Arabis, but the silique terete and the whole plant glabrous. Flowers white.

1. T. salsuginea (Pallas) O.E. Schulz (Arabidopsis glauca (Nutt) Rydb.; Halimolobos virgata AA.) -- Glabrous and glaucous biennial resembling an Arabis. Rather branchy. Stem leafy, the leaves oblong, entire, deeply amplexicaul. Siliques nearly

erect on widely divergent pedicels. Mid spring to mid fall.
Sandy alkaline soils. -- Mack-Y, (wO)-Man-BC, (US, Eur).

28. ARABIS L.

ROCK CRESS

A basic type with a typically narrow silique flattened parallel to the septum. Flowers white to mauve. Silique dehiscent to the tip, without a beak. Stigma sessile or nearly so. Pubescence present, of branched or stellate hairs, often with some simple ones mixed in. One species is quite atypical.

- a. Siliques recurved-falcate and slightly ascending to descending or pendulous and straight.
 - b. Pedicels sharply reflexed at base; siliques pendent, straight 9. A. retrofracta
 - bb. Pedicels and siliques spreading to descending.
 - c. Silique 2-5 cm long 8. A. Lemmonii
 - cc. Longer, 5-10 cm, but narrower.... 7. A. divaricarpa
- aa. Siliques ascending to erect, mostly straight.
 - d. Pedicels and siliques closely appressed to the rachis and parallel to one another.
 - e. Silique \pm 1 mm wide, cylindric to \pm flattened.
 - f. Flowers yellow, silique 5-9 cm long 2. A. glabra
 - ff. Flowers white, silique 3-5 cm long 4. A. hirsuta
 - ee. Siliques 1.5-3.0 mm wide, strongly flattened.
 - g. Rosette leaves with malpighiaceous pubescence 5. A. Drummondii
 - gg. Rosette leaves glabrous to densely stellate pubescent 6. A. Lyallii
- dd. Pedicels and siliques \pm divergent.
 - h. Siliques 5-7 cm long 7. A. divaricarpa
 - hh. Siliques 1-5 cm long.
 - i. Siliques 1.5-3.0 mm wide.
 - j. Siliques 3-5 cm long 6. A. Lyallii
 - jj. Siliques shorter, 1-3 cm long 10. A. arenicola
 - ii. Siliques narrower, 0.5-1.5 mm wide.
 - k. Basal leaves lyrate to pinna-tifid 1. A. lyrata
 - kk. Entire 3. A. Nuttallii

1. A. lyrata L. -- Rosette leaves sometimes dentate, but mostly lyrate-pinnatifid. Stems 1-3 dm high, often numerous. Stem leaves oblanceolate to oblinear, long cuneate at base. Siliques divergent, about 2-3 cm long. Mid spring to mid summer. Sandy places, especially in open Jack Pine forests. -- Mack-Aka, (Q)-O-BC, US, (Eur).

The distinction of a less pubescent var. kamchatica Fisher does not appear to be taxonomically significant.

2. A. glabra (L.) Bernh. (Turritis glabra L.) -- Tower-Mustard (Moutarde blanche, Tourette) -- Siliques terete, flowers yellow. Tall and stiffly erect biennial, somewhat glaucous, glabrous except near the base and on the rosette. Siliques (5)-6-7-(9) cm long, appressed. Summer. Sandy or rocky soils, in open or semi-open places, often weedy. -- Y-Aka, Q-BC, US, Eur.

3. A. Nuttallii Rob. -- Resembling A. lyrata but the leaves entire. Plant glabrous above, pilose below. Stem-leaves broader, oblong to oblanceolate, cuneate at base. Siliques divergent, about 2 cm long. Mid to late spring. Dry rocky places in the foothills. -- swAlta-BC, US.

Porsild 1951 would extend the range by about 600 miles to Withehorse in southwestern, Yukon. But the justifying specimen (CAN; DAO, photo) is rather unconvincing, being fragmentary, barely coming into flower and does not seem susceptible of uncontroversial identification.

4. A. hirsuta (L.) Scop. var. hirsuta (var. pyncocarpa (Hopkins) Rollins; A. ovata (Pursh) Poirat; A. pyncocarpa Hopkins) -- (Moutarde blanche, Tourette) -- Stiffly erect and generally resembling A. glabra, but not so tall, hairy up to about the middle, the siliques somewhat flattened and shorter, 3-5 cm long. Petals 3-5 mm long. Pod tightly appressed to the rachis. Late spring to early summer. Dry open places. -- Mack-Aka, NS, NB-BC, US, Eur -- Var. glabrata T. & G. -- Flowers larger, the petals 5-10 mm long. Pubescence coarser, not so abundant and generally restricted to the lower part of the plant. -- (swAlta) -sBC, nwUS.

The american plants (var. pyncocarpa) reputedly differ from the eurasian ones. The difference, if real, is not evident to us.

5. A. Drummondii Gray var. Drummondii -- Siliques stiffly appressed as in A. glabra and A. hirsuta, but wider and strongly flattened. Biennial, 4-10 dm high. Rosette leaves and base of stem malpighiaceus-pubescent, otherwise glabrous. Siliques 5-7 cm long., 1.5-2.2 mm wide. First half of summer. Dry places near the edge of woods. -- Mack-Aka, (L-NF), NS, NB-BC, US -- Var. connexa (Greene) Fern. -- Siliques broader, 2.2-3.0 mm wide. -- NF, seQ, swAlta-sBC, (US).

6. A. Lyallii Watson -- Similar to the preceeding, but shorter, perennial, stellate-pubescent, and the siliques not always tightly appressed. Stem (1)-2-3-(5) dm high. Rosette leaves densely stellate-puberulent to nearly glabrous, the plant otherwise glabrous. Flowers mauve. Siliques (2)-3-5-(6) cm long, 2.0-2.5 mm wide, tightly appressed to somewhat divergent, often only 5 pods or less per plant. Mid summer. Rocky places at alpine and subalpine levels. -- swAlta-BC, US.

7. A. divaricarpa Nelson var. divaricarpa (A. brachycarpa (T. & G.) Britton) -- A middling and variable type, with long and narrow siliques spreading at a variety of angles. Stem 3-8 dm high, hirsute near base. Rosette and lower leaves stel-

late-puberulent, the plant otherwise glabrous except sometimes the tips of the sepals. Flowers usually mauve. Silique 5-7 cm long, (1.0)-1.5-2.2 mm wide, strongly flattened. Fruits straight and ascending at about 45° in the typical variety. Late spring to early summer. Dry and well drained, open places. -- Mack-(Y-Aka), NB-BC, US -- Var. dacotica (Greene) Boivin (var. hemicylindrica Boivin, var. pinetorum AA.; A. Bourgoyii Rydb.; A. Holboellii var. pinetorum AA.) -- Inflorescence more variable. Siliques straight to falcate, spreading to descending, sometimes spreading at a variety of angles in the same inflorescence, or even nearly pendulous. Pedicels always glabrous, always ascending to spreading, or at most gradually recurved, never abruptly reflexed at base. Flowers ascending to spreading at anthesis. Inflorescence sometimes somewhat secund. More common in our area. -- Mack-Aka, Q-BC, US.

Var. dacotica is the common phase in the western part of the range. Further east it is highly localized and almost entirely replaced by the typical phase.

8. A. Lemmonii Watson var. Lemmonii -- Siliques falcate and more or less spreading in a second raceme. Perennial, 1-4 dm high, stellate-puberulent below. Siliques (2)-3-4-(5) cm long, 2.0-2.5 mm wide. Mid summer. Alpine shale slides and outcrops. -- swAlta-BC, wUS -- Var. drepanoloba (Greene) Rollins -- Siliques broader, 2.5-3.5 mm wide. -- swAlta, wUS.

9. A. retrofracta Graham var. retrofracta (A. Holboellii Horn. var. retrofracta (Graham) Rydb.) -- Pedicels abruptly reflexed at base and normally stellate-puberulent. Biennial, stellate-puberulent below. Rosette leaves somewhat longer than the stem leaves. Inflorescence commonly somewhat secund. Flowers mostly white, spreading to descending at anthesis. Pods 4-5 cm long, about 1 mm wide, pendent, straight. Late spring and early summer. Dry and open places. -- Mack-Aka, scQ-BC, US -- Var. Collinsii (Fern.) Boivin (A. Collinsii Fern.; A. Holboellii Horn. var. Collinsii (Fern.) Rollins) -- Stem hirsute near the base, the pubescence coarser and simple or at least less divided than that of the rosette leaves. More common and especially frequent on dry hillsides. -- Mack-Y, Q-BC, US -- Var. multicaulis Boivin -- Short-lived perennial. Many-stemmed. Rosette leaves about twice as long as the few stem leaves. Pods 5-6 cm long, about 1.5 mm broad. Pubescence as in var. retrofracta -- Y, Alta.

Var. retrofracta and var. Collinsii have been gradually filling out to each other's range and may eventually turn out to be sympatric phenotypes of no particular significance.

The extension by Boivin 1966 of the range of var. multicaulis to Alaska was apparently a mere lapsus calami.

Our species is often treated as so many varieties under A. Holboellii Horn., but the latter has much larger siliques, 2.0-2.5 mm wide, falcate, strongly flattened and descendent rather than pendent. Further it seems restricted to Greenland and reports from various other areas, including those from Bic, Quebec, were based on specimens of other species. Reports by Hitchcock

1964 Rollins 1941 and Hultén 1945 of typical Holboellii from Wash., B.C. and northward have not been investigated yet.

10. A. arenicola (Rich.) Gelert var. arenicola -- Similar to A. Nuttallii, but the basal leaves dentate and the pods coarser. Perennial, glabrous, 1-2 dm high. Stem leaves slightly fleshy, oblong to oblanceolate, cuneate at base. Raceme secund or not. Silique straight, ascending, (1)-2-(3) cm long, 1.5-2.5 mm wide. First half of summer. Arctic and subarctic sands and gravels. -- G-neK, nL, nQ,nwS -- Var. pubescens (Watson) Gelert-- Basal leaves and lower part of stem hirsute. -- (F)-K-eMack, nQ-nMan-nwS.

29. ERYSIMUM L.

TREACLE MUSTARD

Flowers yellow; silique not compressed; pubescence malpighiaceous, sometimes also partly stellate. Biennials or annuals.

a. Flowers purple; pods purplish 5. E. Pallasii

aa. Flowers yellow; pods green.

b. Petals 15-25 mm; pods 6-10 cm long 4. E. asperum

bb. Petals and fruits shorter.

c. Plants grayish-puberulent; petals 6-10 mm long.

d. Leaves with mostly 2-pronged hairs 3. E. inconspicuum

dd. Mostly stellate with 3-5

branches 2. E. hieraciifolium

cc. Plant green; petals 3-5 mm long ..
..... 1. E. cheiranthoides

1. E. CHEIRANTHOIDES L. (Cheirinia cheiranthoides (L.) Link) -- Wormseed-Mustard, Treacle-Mustard (Herbe aux chantes) -- Tall, virgate, nondescript annual. Leaves lanceolate, entire or nearly so. Pedicels thin, about 1 cm long. The whole plant abundantly puberulent, yet remaining greenish. All summer. Disturbed soils. -- (seK)-Mack-Aka, NF, NS-BC, US, Eur, (Afr).

Reputedly native in Alaska (Hultén 1945) and in Saskatchewan (Breitung 1959). We are skeptical and note that the label data of the specimens at hand would hardly support this opinion.

2. E. HIERACIIFOLIUM L. (E. durum Presl & Presl) -- Very much like the next but the pubescence mainly stellate. Pods commonly appressed. Summer. Rare roadside weed: Stoughton -- NS, Q-O, S, Eur.

There is also a sight record for Moose Jaw but no substantiating specimens for such a critical identification.

European botanists will often recognize the segregate E. durum mainly on its slightly smaller flowers and entire leaves (sinuate in E. hieraciifolium). The distinction may not be a tenable one as we have noticed a number of intermediate specimens, combining the smaller flowers with the sinuate leaves, and originating from various parts of the European range, including Sweden. Our introduced plants are a closer match for these intermediates.

3. E. inconspicuum (Watson) MacM. var. inconspicuum (E. parviflorum Nutt.; Cheirinia inconspicua (Watson) Rydb.) -- Similar to the following and often growing with it, but generally smaller and the pods narrowly divergent. Siliques 2-5 cm long. Pubescence almost entirely of malpighiaceae hairs, with a few stellate (3 branches) hairs mixed in. Early to mid summer. Steppes and disturbed soils. -- Mack-Y, NS, NB-BC, US.

Our variety has seeds \pm 1 mm long. In fruit a var. coarctatum (Fern.) G.B. Rossbach may be distinguished by its larger seeds, 2 mm long or a bit less. Its siliques also average a bit longer. Var. coarctatum is a disjunct entity, being known from around the Gulf of Saint Lawrence and also from northern B.C. (at Taylor) to Alaska. All the material examined from Alaska belonged to var. coarctatum.

4. E. asperum (Nutt.) DC. var. asperum (Cheirinia aspera (Nutt.) Rydb.) -- Western Wallflower, Prairie-Rocket -- Very long, spreading and squarish pods. Grayish-puberulent throughout, 2-5 dm high. Leaves remotely dentate. The yellow flowers rather large for the family. Early summer. Rolling steppes and sandhills. -- Q-Alta-(BC), US.

Native with us, but only a casual adventive further east. Our typical phase may be contrasted with the following variety.

Var. angustatum (Rydb.) stat. n., E. angustatum Rydb., Bull. N.Y. Bot. Gard. 2: 171. 1901 has narrower leaves, (1)-2-3-(5) mm wide, and nearly all are entire. It is known only from Dawson and vicinity in Yukon. Reports from Alaska seem to be based on Yukon collections from the vicinity of Dawson.

5. E. Pallasii (Pursh) Fern. var. Pallasii -- The purple flowers large and showy; the pods half as long as the plant. Biennial, 1-2 dm high. Leaves linear, numerous, crowded. Petals 1-2 cm long. Siliques 6-10 cm long, ascending. Early summer. Shale and gravel slides. -- G-F, Mack-Y-(Aka, swAlta).

The alaskan var. bracteosum G.B. Rossbach is leafy-bracted in the lower part of the raceme(s).

30. ALYSSUM L.

ALYSSUM

Superficially resembling Lepidium, but the silicle compressed parallel to the partition. Petals white, entire.

a. Silicle stellate-pubescent 1. A. desertorum
aa. Glabrous 2. A. alyssoides

1. A. DESERTORUM Stapf (A. alyssoides AA.) -- Branchy annual, stellate-puberulent throughout, except the silicles. Sepals falling off before the silicle is fully grown. Pod about 3 mm wide, orbicular, very flat along the edge, but strongly convex nearer the center. Mid spring to late summer. Along roads and railways, rare. -- sMan-swAlta, nwUS, Eur.

2. A. ALYSSOIDES L. -- Closely resembling the first but the silicle stellate-pubescent, like the rest of the plant. Sepals persisting on the fruit until it is ready to shed its seeds. Early summer. Rare weed of waste places, first appeared in 1964 at Coleman. -- Q-O, swAlta-BC, US, Eur, (Oc).

31. BERTOREA DC.

Resembles Draba, but the white petals are bifid. No rosette.
ERYSIMUM

1. B. INCANA (L.) DC. -- Like a large, white-flowered Dra-
ba. Annual, 1-10 dm high, densely stellate-puberulent through-
out including the fruits. Leaves entire, Silicle topped by a
thin style, about 1/3-1/2 as long as the body of the fruit. Sum-
mer and fall. Roadsides and fields; locally abundant. -- NS,
NB-S-(Alta)-BC, US, Eur.

The only Alberta report goes back to Groh 1944 and was ba-
sed on an High River specimen which was returned to its collec-
tor, hence is not readily verifiable.

32. BRAYA Sternb. & Hoppe

Variable. Our species resembles an Arabis or Erysimum with
white flowers and torulose siliques.

1. B. humilis (C.A. Meyer) Rob. var. interior (Böcher)
Boivin -- Lowermost flower (or fruit) bearing a bract $\frac{1}{4}$ of the
way up its pedicel. Tufted perennial up to 3 dm high. Leaves
linear, the main ones remotely dentate. Flowers white and more
or less purplish tinged. Silique straight or falcate, 1.5-3.0
cm long, about 0.5 mm wide or slightly broader. Style about
3/4 mm long. Stigma $1\frac{1}{2}$ -2 times broader than the style. Around
mid summer. Arctic shores and open sands and gravels. -- nO-
nMan-- Var. americana (Hooker) Boivin (B. Richardsonii (Rydb.)
Fern.) -- Bract about halfway up the pedicel. Leaves all or
mostly entire. Siliques 1.0-2.5 cm long, about 1 mm wide. Style
about 0.5 mm long. Stigma barely wider than the style. River
gravels and roadsides in the mountains. -- (NF?), sWAlta-(BC).

In a monograph of the genus by E.C. Abbe, Braya in Boreal
Eastern America, Rhodora 50: 1-15. 1948, this species was sub-
divided in taxa termed "races", but unnamed and merely numbered.
These taxa are somewhat confluent morphologically and not always
readily defined, yet they are of restricted distribution and of
some taxonomic and phytogeographical interest. As could be ex-
pected, the merely numbered races were soon to receive one or
more names each. What is most remarkable is the wide variety of
ranks used in naming a series of essentially comparable taxa;
they range from form (capitata) to variety (interior) to subspe-
cies (arctica) to species (novae-angliae). Two of these taxa
were even placed into a segregate genus (Torularia). This wide
range of usage reflects in part the lack of agreement among mo-
dern taxonomists on the definition of the various taxonomic
categories currently in use. It may also reflect the indifferen-
ce of some taxonomists to the philosophic justification of said
categories. The most common type of indifference is that of the
taxonomist who would call everything a species. However this
latter attitude does not seem to have come into play in the pre-
sent case.

All these segregates of Braya humilis have the same nature
and the same value; logically it would seem highly desirable that
they be rated as all of the same rank. Which rank in this case
corresponds to our concept of variety. Hence the following
transfers with the concordance to Abbe's races.

Var. Abbei (Böcher) stat. n., B. novae-angliae (Rydb.) Th.
Spr. ssp. Abbei (Böcher), Medd. Grøn. 124, 7: 21. 1956; Race 4.

Var. americana (Hooker) stat. n., B. alpina Sternb. & Hoppe
var. americana Hooker, Fl. Bor. Am. 1: 65. 1830.

Var. glabella (Rich.) stat. n., B. alpina Stern. & Hoppe
var. glabella Rich. ex Franklin, Narr. Journ., Bot. App. 743.
1823; Race 1.

Var. interior (Böcher) stat. n., B. novae-angliae (Rydb.)
Th. Spr. var. interior Böcher, Medd. Grøn. 124, 7: 20. 1956;
Race 6.

Var. laurentiana (Böcher) stat. n., B. novae-angliae (Rydb.)
Th. Spr. var. laurentiana Böcher, Medd. Grøn. 124, 7: 19. 1956;
Race 3.

Var. leiocarpa (Trautv.) Fern., Rhodora 39: 276. 1937;
Races 2 et 5.

Var. ventosa (Rollins) stat. n., ssp. ventosa Rollins, Rho-
dora 55: 114. 1954.

Comparable designations will now be available for these
essentially comparable entities.

33. MALCOLMIA Br.

Similar to Hesperis but the stigmas back to back, decurrent
on the entire style.

1. M. AFRICANA (L.) Br. (Macloviana africana sphalm.) --
Lowest silique borne ± opposite a normal leaf. Diffuse annual,
puberulent through. Sepals and petals persistent until the
fruit is about fully grown. Flowers violet or purple. Silique
about 5 cm long, terete. Early summer. Cultivated and casually
reseeding itself; doubtfully reported for Swift Current. --
(swS), US, Eur, (Afr).

34. HESPERIS L.

ROCKET

Style bifid at tip and the stigmas decurrent on the inner
face of the lobes, thus the two stigmas facing one another.
Otherwise, similar to Erysimum, but the flowers purple.

1. H. MATRONALIS L. -- Dame's Violet, Mother-of-the-Eve-
ning (Julienne des dames) -- Showy annual, tall and virgate,
with large purple flowers. Commonly around 1 m high. Leaves
dentate, rather large for the family. Petals 1.5-2.5 cm long.
Fruit 6-10 cm long, thin, somewhat torulose, narrowly divergent.
Summer and fall. Commonly cultivated and readily reseeding it-
self in open soil, sometimes in great abundance, invading shaded
places. -- (Aka), NF, NS-BC, US, Eur.

35. MATTHIOLA Br.

Style more deeply bifid than in Hesperis, developing into
a pair of horns at the summit of the mature fruit.

1. M. BICORNIS DC. -- Evening-Stock, Perfume-Plant --
Fruit ending in a pair of divergent and horn-like projections
about 5 mm long. Similar to Hesperis matronalis, but more dif-
fusely branched and the flowers and fruits subsessile. Early

summer. Casual and fleeting escape from flower gardens: Saskatoon. O, S, Eur.

36. CONRINGIA Link HARE'S EAR MUSTARD

Siliques quadrangular, tapering to a short indehiscent and seedless beak.

1. *C. ORIENTALIS* (L.) Dum. (*Erysimum orientale* (L.) Br.)-- Hare's Ear -- Glaucous and glabrous annual, usually virgate, 3-8 dm high, with rather large, entire and clasping leaves. Leaves oblong, deeply amplexicaul, entire or subundulate at margin. Flowers pale yellow, almost white. Silique about 1 dm long. First half of summer. Frequent weed of disturbed soils, rarely abundant. -- (G), NF, NS-(PEI)-NB-BC, US, Eur.

37. HALIMOLOBOS Tausch

Similar to *Arabis*, but the silique is terete.

1. *H. virgata* (Nutt.) O.E. Schulz -- Abundantly hirsute and stellate throughout, except the terete siliques. Otherwise similar to *Arabis*. Petals 2.0-3.5 mm long, white. Pods 1-3 cm long, nearly erect on divergent pedicels. Spring and first half of summer. Steppes, rare: Boisé Coteau. -- (Y), swS-seAlta, (US).

The Manitoba report of *H. mollis* (Hooker) Rollins is based on two fragments collected in early flowering and labeled Anderson, L. Winnipeg, Grand Rapide, Fort de traite, 17 June 1851 (CAN; DAO, photo). Because of the pubescence, the date of flowering, the direction of the pedicels, etc., we are of the opinion that these fragments belong to *Arabis divaricarpa*.

Coronopus didymus (L.) Sm. is reported from Banff, Alta., by R. Campbell, Can. Rec. Sc. 8: 172. 1900. This was repeated by Groh 1950. Most later authors have ignored the many papers by Campbell and his numerous additions and range extensions. And rightly so as nearly all his unusual reports and many of the run of the mill ones are based on errors of identification. Thus his reports of *Silene acaulis* and *Sibbaldia procumbens* from Wolseley, Sask. are based respectively on *Phlox Hoodii* (QK; DAO, photo) and *Potentilla concinna* (QK; DAO, photo). Other reports by Campbell were systematically ignored; too many of them border on the fantastic.

Order 41. RESEDALES

Like the 4 previous orders, the floral parts free except for the fused carpels. But the flower zygomorphic. Single family.

✓A physiographic feature similar to the Coteau de Prairie and the Missouri Coteau; the northern edge, 200 to 2000 feet high, of a plateau which runs along the northern edge of the Cypress Hills east to the Big Muddy Lake, south to Plentywood in Montana.

72. RESEDACEAE (MIGNONETTE FAMILY)

Floral parts variable in number, mostly in 5's or 6's. Sepals not all the same size. The petals also of different sizes.

1. RESEDA L. MIGNONETTE

Petals palmately lobed from a scale-like basal portion.

Ovary (and fruit) incompletely closed at summit.

- a. Leaf entire in the lower half or third, pinnatipartite to bipinnatipartite above the middle....1. R. lutea
 aa. Leaf pinnatipartite to the base 2. R. alba
 1. R. LUTEA L. -- Dyer's Rocket, Mignonette (Grand'mère, Réséda sauvage) -- Leaf entire to trifid below the middle, trifid to much divided above. Tufted perennial. Perianth in 6's. Flowers yellow. Late spring to late summer. Cultivated and rarely escaped. -- O-S, BC, US, Eur.

We know of only one Saskatchewan collection, from Grenfell (SASK; DAO, photo). The earlier report by Groh 1944 from Trevarga was based on a specimen (DAO) since revised to R. alba.

2. R. ALBA L. -- Similar to the preceding but the leaf division of a more standard pattern. Perianth in 5's, but the carpels 4. Flowers white. Late summer. Rare garden escape. -- Q-S, BC, US, Eur.

Order 42. CARYOPHYLLALES

This and the next two orders have axile or central placentation; that is the ovules are borne, not along the edges of the carpels, but on a central column. In this Order the petals are usually present and the fruit is many-seeded. Leaves opposite, except some Portulacaceae.

- a. Sepals 3-5.
 b. Ovary 2-5 locular 73. Elatinaceae
 bb. Ovary essentially unilocular 74. Caryophyllaceae
 aa. Sepals 2. 75. Portulacaceae

73. ELATINACEAE (WATERWORT FAMILY)

Like the following family, but the ovary fully divided into 2-5 locules.

1. ELATINE L.

Inconspicuous and insignificant small plants growing on the mud. Wall of the fruit very thin and transparent, the seeds clearly distinct inside.

1. E. triandra Schkuhr var. americana (Pursh) Fassett (var. brachysperma AA.; E. americana (Pursh) Arnott) -- Leaves usually with a deep-red marginal dot at the end of each nerve. Stem less than 1 dm long. Leaves obovate to oblanceolate. Flowers axillary, inconspicuous, nearly always 3-merous. Fruit 1-2 mm across, subglobose. Seeds elongate, reticulate, the areoles hexagonal. Mid to late summer. Shallow water and mud flats.-- sMack, NB-Alta-(BC), US, (CA), eEur.

The eurasian var. triandra is a generally larger plant with mostly lanceolate leaves, the marginal notches usually deeper and the placentation more clearly axile. The latter is prac-

tically basal in our variety.

74. CARYOPHYLLACEAE

(PINK FAMILY)

The basic type of the order. The opposite leaves linked by transnodal lines of tissue or by pairs of stipules that are more or less fused 2 by 2 so that they usually look as if there was only 2 stipules to each pair of leaves. Seeds centrally borne. Ovary unilocular or partly 3-celled.

- a. Sepals free Group A
- aa. Sepals fused Group B

Group A

Both sepals and petals free.

- a. Stipules present.
 - b. Axillary fascicles present in every axil, the leaves thus seemingly verticillate..... 5. Spergula
 - bb. Axillary fascicles irregularly distributed, the leaves obviously opposite 6. Spergularia
- aa. Stipules lacking.
 - c. Petals deeply bilobed or bifid, often appearing as if there were 10 petals.
 - d. Capsule dehiscent into 6 to 8 valves...1. Stellaria
 - dd. Capsule dehiscent at the apex only and by 10 teeth2. Cerastium
 - cc. Petals (4)-5, entire or emarginate.
 - e. Styles (and valves) as many as the sepals, usually 5 3. Sagina
 - ee. Style (and valves) only 3 and fewer than the sepals 4. Arenaria

Group B

Sepals fused, but the petals free.

- a. Calyx subtended by 1-3 pairs of bracts 11. Dianthus
- aa. Calyx not bracted at base.
 - b. Calyx-lobes 2-3 cm long, much longer than the tube7. Agrostemma
 - bb. Calyx-lobes much smaller and shorter than the tube.
 - c. Calyx with 5 main nerves.
 - d. Flower 1 cm long or less 10. Gypsophila
 - dd. Much larger 12. Saponaria
 - cc. Calyx with 10-35 nerves.
 - e. Calyx with 10 main nerves ending alternately in the lobes and sinuses.
 - f. Styles essentially 3 8. Silene
 - ff. Styles 5, exceptionally less....9. Lychnis
 - ee. Calyx with 20-35 nerves.
 - g. Calyx glabrous or glandular, the lobes symmetrical 8. Silene

- gg. Calyx hirsute, not glandular,
somewhat asymmetrical at the
mouth 12. Saponaria

1. STELLARIA L. CHICKWEED, STARWORT

Herbs, often weak and tangled, with 5 bifid, white petals.
Styles 3. Capsule opening by 3-(4) bifid valves.

- a. Flowers in the axils of green leaves or bracts..... Group A
aa. Inflorescence bracteolate, the bracts membranous
or membranous-margined Group B

Group A

Flowers solitary and axillary or terminal, or borne in cymes, the latter leafy or somewhat bracteolate, but with green bracts.

- a. Leaves oblong to broadly ovate, the main ones
petiolate.
b. Petiole about half as long as the blade1. S. media
bb. Much shorter, only 1-2 mm long.
c. Leaves broadly ovate and less than
1 cm long 2. S. obtusa
cc. Narrowly ovate and larger; sepals
longer and acute 3. S. crispa
aa. Leaves sessile.
d. Flowers in a terminal, leafy cyme.
e. Petals about as long as to a little
longer than the sepals5. S. crassifolia
ee. Much shorter, or even lacking 7. S. calycantha
dd. Flowers solitary.
f. Plant densely glandular-pubescent
throughout 4. S. americana
ff. Foliage glabrous or slightly puberulent.
g. Leaves fleshy, oblong to ovate...6. S. humifusa
gg. Leaves lanceolate to linear.
h. Flowers mostly appearing axil-
lary; leaves of branches only
half as large as the stem-leaves..
..... 5. S. crassifolia
hh. Flowers clearly terminal; branch-
leaves not reduced 10. S. laeta

Group B

Flowers in bracted cymes, the bracts membranous or at least membranous-margined.

- a. Inflorescence terminal, of only 1-(3) flowers ..
..... 12. S. Edwardsii
aa. Flowers more numerous.
b. Pedicels ascending to erect; the central
flowers on more stiffly erect pedicels

- than the others 11. S. longipes
 bb. Inflorescence more open, with some of
 the pedicels, especially those of the central
 flowers, spreading to deflexed.
 c. Petals about as long as, to slightly longer
 than, the sepals 9. S. longifolia
 cc. Absent or at least smaller, about 2/3 as
 long as the sepals or shorter.
 d. Leaves irregularly and rather long-
 ciliate towards the base; petals
 mostly present 7. S. calycantha
 dd. Eciliate; petals absent..... 8. S. gonomischa

1. S. MEDIA (L.) Cyrillo -- Chickweed (Cresson, Mouron des oiseaux) -- Leaves broadly ovate, the main ones petiolate, the others \pm sessile. Petiole about half as long to nearly as long as the blade. Leaf commonly 1 cm wide. Stem pilose in lines. Inflorescence diffuse to well defined, leafy to bracteolate, the bracts green. Sepals pilose. Petals short. Early summer to early frosts. Forming tangled carpels in waste places and on cultivated ground. -- G, Mack-Aka, L-SPM, NS-BC, US, Eur, Oc.

2. S. obtusa Eng. -- Forming a tangled carpet and much like a diminutive S. media. Glabrous. Leaves mostly around 5 mm long, on pedicels mostly around 1 mm long. Flowers solitary in the manner of the next. Sepals mostly oblong, 1.5-2.5 mm long, broadly acute to rounded at tip. Petals minute or lacking. Late spring and early summer. Wet places and shores, rare: Blairmore. -- sAka, swAlta-seBC, wUS.

3. S. crispa C. & S. -- Also resembles the first, but the leaves not quite so broad and nearly sessile. Glabrous. Stem elongated. Branches few. Leaves gradually smaller. Flowers remote, solitary, seemingly axillary and only one to a node. Sepals lanceolate, 2.5-3.5 mm long, sharply acute. Petals lacking. Late spring to mid summer. Damp woods and shores in Waterton. -- (swY)-Aka, (swAlta)-BC, US.

4. S. americana (Porter) Standley -- Glandular-puberulent throughout. Low, rather leafy and few-flowered. Leaves rather large, oblong, sessile. Mid summer. Alpine shale slides in Waterton. -- swAlta, (US).

5. S. crassifolia Ehrh. -- Rather nondescript and often misidentified. Leaves lanceolate, in two sizes, those of the branches only half as large. Variable in habit, but glabrous and slightly fleshy. Flowers in leafy cymes or terminal and solitary, often appearing axillary through the development of a subterminal branch. Petals about as long to slightly longer than the sepals. First half of summer. Shores and damp places. -- (F)-K-Aka, L-(NF, NS)-PEI-BC, US, Eur -- F. gemmificans Norman (S. gracilis Rich.) Bulbiferous in the axils of the upper leaves. -- (K), Q-S-(Alta). Perhaps the normal autumnal phase.

Two collections (CAN, DAO) reported by Turner 1949 as S. sitchana Steudel have since been revised to S. crassifolia.

6. S. humifusa Rottb. var. humifusa (var. suberecta Boivin) -- Fleshy and matted, the small leaves ovate to oblong. Forming a tangled carpet. Glabrous. Leaves all about the same size, commonly 4-6 mm long. Flower solitary, terminal. Petals about as long as the sepals. Mid summer. Sandy to rocky seashores. -- G-Aka, L-(NF)-SPM, NS-Q-(neO)-nMan, Eur.

On the Pacific Coast and on Prince Edward Island the typical variety is partly replaced by a var. oblongifolia Fenzl, more or less erect and with longer and narrower leaves, the latter being ± lanceolate and mostly 8-15 mm long.

7. S. calycantha (Led.) Bong. var. calycantha (var. isophylla Fern., var. latifolia Boivin; S. borealis Big.) -- Flowers in a leafy cyme, the petals small. Very variable in size. Leaves slightly ciliate towards the base; internodes sometimes very finely scabrous; otherwise the whole plant glabrous. Leaves elliptic to linear. Flowers in a single terminal cyme. Petals about 2/3 as long as the sepals, or shorter and vestigial. Sepals 1.5-3.0 mm long, or up to 4 mm in fruit. First half of summer. Damp places. -- G, (K)-Mack-Aka, L-NF-(SPM, NS-PEI)-NB-BC, US, Eur -- Var. floribunda Fern. -- Inflorescence ample and the flowers rather numerous. Leaves becoming gradually smaller into the inflorescence, the ultimate bracts scarious or green with a wide scarious margin. -- (NF), NS-(PEI)-NB-Man, (BC), US.

S. graminea L. is not improbable for our area. Resembles typical S. calycantha, but all the inflorescence bracts are membranous and the larger sepals are usually ciliate. Tending to be erect and (2)-4-(8) dm high. Leaves lanceolate or somewhat narrower. Cyme very diffuse. Sepals 4-6 mm long. However, previous reports of this weed from our area do not seem justified. H.H. Marshall at Morden (DAO) has been revised to S. longipes; J.M. Gillett at Churchill (DAO) has been revised to S. crassifolia and W. Krivda at The Pas (CAN; DAO, photo) is typical S. longifolia. We have found no Roseisle specimen in the private herbaria of de Ruyck and Champagne; they held only collections from Riding Mountain and Pine Falls which we have revised to S. longipes. Finally, a York Factory collection distributed as S. graminea has also been revised to S. longifolia, while the collection reported from Lake Waskesiu (SASK) was revised to S. longipes in 1956.

8. S. gonomischia Boivin (S. umbellata AA.) -- Resembles S. calycantha, especially var. floribunda, but eciliate and mostly about 1 dm high and the upper stem internode (or lower inflorescence internode) rather elongate, often half as long as the height of the plant. Stem leaves abruptly passing into the inflorescence bracts, the latter many times shorter. Cyme single, terminal and diffuse, the internodes mostly longer than the pedicels, the ultimate bracts scarious-margined. Flowers small and apetalous, the sepals mostly 2 mm long. Capsule less than twice as long as the sepals. Mid summer. Wet spots in subal-

pine forests; Waterton. -- swAlta, wUS.

The related asiatic S. umbellata Turcz. has a more congested inflorescence, subumbellate in the manner of Holosteum umbellatum L., capsules larger, at least twice as long as the sepals, etc. We have seen no matching specimen from North America and despite a number of reports of S. umbellata for Canada, all specimens examined proved to belong to other species, mostly S. calycantha.

9. S. longifolia Muhl. var. longifolia (S. graminea AA.) -- Rather nondescript and easily confused with S. calycantha and the next two species. The upper pair of stem-leaves usually subtends 1-(2) elongate branches that will often overtop the inflorescence. (Such a branch is always lacking in S. calycantha and S. longipes). The leaves are narrow, linear to linear-lanceolate, up to 1.5-5.0 mm wide, usually with parallel margins, sometimes slightly wider towards the middle. (In the other species, and especially so in S. laeta, they tend to be broadest below the middle and tapering to the tip). Inflorescence bracteolate throughout. (Leafy at base in S. calycantha var. floribunda). Sepals 2.8-4.0 long, not ciliate. Petals longer than the sepals. (Shorter in S. calycantha). Capsule greenish to straw-coloured or pale brown. Mid spring to late summer. Forming tangled masses in wet places. -- (NF)-SPM, NS, NB-BC, US -- Var. atrata J.W. Moore (S. atrata (J.W. Moore) Boivin) -- Sepals smaller and ciliate. Capsule purplish black. Generally smaller throughout. Leaves mostly 0.5-1.0 mm wide, the largest rarely up to 2 mm. Sepals 2-3 mm long. The usual phase northward. -- Mack-Y, (Q)-O-Man, Alta, US -- Var. eciliata Boivin (S. atrata (J.W. Moore) Boivin var. eciliata Boivin) -- As var. atrata, but the sepals eciliate. The common phase westward. -- (seK)-Mack-Aka, Q-BC.

10. S. laeta Rich. var. laeta -- A small species with a single (rarely 2-3) terminal flower. Usually less than 1 dm high. Stoloniferous and forming dense to lax carpets. Leaves narrowly ovate to narrowly lanceolate, \pm canaliculate, all about the same size or the upper reduced, but not reduced to membranous bracts. Not glabrous, but at least the sepals ciliate and also commonly puberulent on back; the stem often pubescent. Generally similar to the next two species but for the reduced inflorescence. First half of summer. Loose sands. -- G-F-(K)-Mack-Aka, nQ, nMan, (swAlta)-BC, (Eur) -- Var. altocaulis (Hultén) Boivin (S. Hultenii Boivin; S. monantha Hultén) -- Sepals not ciliate. Plant entirely glabrous or sometimes somewhat puberulent. Loose gravels and shales. -- G-Aka, L-NF, nNB-nMan, swAlta-BC, wUS.

11. S. longipes Goldie (S. graminea AA.; S. stricta Rich.) -- Commonly a very glaucous herb with strongly contrasting dark purple capsules. Glabrous perennial, about 2 dm high, stoloniferous, green to glaucous. Leaves somewhat carinate, narrowly lanceolate to linear, broadest near the base and gradually tapering to a very sharp point. Inflorescence open, occupying the upper half of the plant, bracteolate, the bracts membranous.

Pedicels ascending to erect, the central one longer and stiffly erect. Petals longer than the sepals. Early to mid summer. Forming tangled carpets on moist sands or gravels. -- seF-(K)-Mack-Aka, L-(NF), NB-Alta-(BC, US) -- Var. subvestita (Greene) Pol. (S. subvestita Greene) -- Stem \pm pubescent. Leaves glabrous to slightly pubescent. -- (K-Y)-Aka, Q-O-(Man)-S-Alta-(neBC) -- Var. arenicola (Raup) Boivin (S. arenicola Raup) -- Capsule straw-coloured, the valves becoming strongly recurved and reflexed. Sand dunes of lake Athabaska. -- nWS.

12. S. Edwardsii Br. var. Edwardsii (S. ciliatosepala Trautv.) -- Somewhat intermediate between S. laeta and S. longipes, the plant small and the inflorescence reduced as in the former, the pedicels with membranous bracts as in the latter. Sepals finely ciliate. Early summer. Sands and gravels. -- G-F-(K-Y)-Aka, nMan, (Eur) -- Var. crassipes (Hultén) Boivin (S. crassipes Hultén) -- Sepals glabrous and not ciliate. -- G-F-(K-Mack, L-NF), nQ-nWS, BC, (Eur).

Reports of S. Alsine from Manitoba were based in part on collections from Gillam and Churchill (DAO) now revised to S. calycantha and on a York Factory specimen (QK; DAO, photo) which belongs to S. crassifolia f. gemmaeformis.

2. CERASTIUM L.

MOUSE-EAR-CHICKWEED

Rather similar to Stellaria, but the styles 5 and the cylindric capsule opening by 10 short teeth.

- a. Annual; capsule 2-3 times as long as the calyx .. 5. C. mutans
- aa. Perennial; capsule usually shorter.
 - b. All leaves but the upper pair subtending an axillary fascicle.
 - c. Foliage green 3. C. arvense
 - cc. White-tomentose 4. C. tomentosum
 - bb. Axillary fascicles few, or more often lacking.
 - d. Leaf and stem pubescence similar, either soft pilose or glandular-pilose to nearly glabrous 1. C. alpinum
 - dd. Pubescence of two types: the leaves stiffly hirsute and ciliate, the stem soft pilose to glandular-puberulent 2. C. vulgatum

1. C. alpinum L. var. alpinum (var. glanduliferum AA., var. strigosum Hultén; C. arcticum Lange, var. vestitum Hultén; C. Beerianum C. & S., var. grandiflorum (Fenzl) Hultén; C. terrae-novae Fern. & Wieg.) -- Perennial with numerous short basal branches forming dense ground cover. Mostly 1 dm high. Pubescence variable, commonly long pilose, varying to glandular or to nearly glabrous. Leaves obovate to narrowly lanceolate, their pubescence similar to that of the stem. Flowers generally few and rather large. Inflorescence bracts usually green. Sepals (3.5)-5.0-8.0-(10.0)mm long. Petals commonly $1\frac{1}{2}$ -2 times

the length of the sepals. First half of summer. Arctic and subarctic gravels. -- G-Aka, L-(NF), Q-NS-(Alta-BC, Eur) -- Var. capillare (Fern. & Wieg.) Boivin (C. Earlei Rydb.) -- Pubescence shorter; the glandular hairs only 0.1-0.3 mm long on the pedicels. Alpine outcrops and shale slides. -- swAlta-BC, wUS.

2. C. VULGATUM L. (var. holosteoides Fries, var. hirsutum Fries; C. holosteoides Fries; C. triviale Link) -- Sometimes seeming to run into the preceeding, but generally taller and of more diffuse growth, with scarious-margined bracts and smaller flowers. Biennial or short-lived perennial, (1)-2-(4) dm high. Leaves \pm lanceolate, uniformly hirsute and ciliate, or nearly glabrous. Stem pubescence different, soft pilose to glandular-pubescent, often densely so, or nearly glabrous. Inflorescence with bracts usually scarious or broadly scarious-margined. Sepals (4)-5-(7) mm long. Petals commonly just a little longer than the sepals. Early to mid summer. More or less ubiquitous weed, not frequent in our region. -- G, Y-Aka, L-SPM, NS-BC, US, (SA), Eur, (Afr, Oc).

3. C. arvense L. (var. viscidulum Greml; C. campestre Greene) -- Whiteweed (Mouron d'alouette) -- Flowering stems appearing very leafy as all leaves, except the upper pair, subtend either a short branch or an axillary tuft of small narrow leaves. Otherwise a perennial generally resembling C. vulgatum but densely glandular-puberulent throughout. Leaves marcescent, narrowly lanceolate to linear. Petals about $1\frac{1}{2}$ times as long as the sepals. Late spring to mid summer. Dry open places. -- (G, K)-Mack-Aka, L-SPM, NS-BC, US, Eur.

4. C. TOMENTOSUM L. -- Snow-in-Summer, Dusty Miller (Barbette, Argentine) -- Foliage as the preceeding, but the whole plant densely white-tomentose. Inflorescence stiff and open, reminiscent of Stellaria longipes. Petals white, large, fading brownish-black. Early summer. Cultivated for its whitish foliage and sometimes spreading to nearby meadows: Matlock. -- NS-PEI, Q-Man, BC, (US), Eur.

5. C. nutans Raf. var. nutans (var. occidentale Boivin) -- Annual. Viscid-pilose, erect, often many-stemmed. Inflorescence with green bracts. Pedicels rather long, geniculate just below the fruit. Petals variable, from $1\frac{1}{2}$ the length of the sepals or shorter to lacking. Capsule 2-3 times longer than the sepals. Summer. Shores and wet shaded ground, rarely weedy. -- sMack, swQ-neBC, US -- Var. brachypodum Eng. (C. brachypodum (Eng.) Rob.) -- Inflorescence more compact, the pedicels not geniculate, but often reflexed, about as long as the capsule, or shorter. Rare and perhaps a mere extreme of variation: Gil-lam, Falcon Lake, Consul. -- Man-S-(Alta), US.

Var. brachypodum is not recognized by Hitchcock 1964. There seems to be good justification for his stand except that in Canada, on the basis of the collections examined to date, the two varieties are far from being sympatric.

3. SAGINA L.

PEARLWORT

Similar to Stellaria, but the petals not bifid, rather entire or merely emarginate. Sepals (4)-5. Styles as many as

the sepals. Capsule opening by (4)-5 entire valves.

- a. Bulbiferous; flowers larger, the petals about twice as long as the sepals 3. S. nodosa
- aa. Not bulbiferous; petals about as long as, to shorter than, the sepals.
 - b. Annual with an evanescent rosette 1. S. decumbens
 - bb. Tufted perennials with a well developed and marcescent rosette.
 - c. Capsule $1\frac{1}{2}$ -2 times as long as the calyx 2. S. saginoides
 - cc. Capsule shorter, slightly longer than the calyx; plant smaller 4. S. nivalis

1. S. DECUMBENS (Ell.) T. & G. -- Inconspicuous and very thin annual. Usually less than 1 dm high. Petals usually insignificant. Flowers alternate in a somewhat racemose inflorescence. Resembling a small Arenaria serpyllifolia in fruit, but the leaves linear. Early summer. Footpaths (?) on light soil. Very rare weed from the eastern U.S.: Cypress and Hand-hills. -- (Aka), NB-Q, S-BC, US.

Probably native in B.C., but more likely introduced elsewhere north of the U.S.A.

The floral mery is variable and on that basis the species is often subdivided into a tetramerous S. decumbens and a pentamerous S. occidentalis. The Canadian material examined does not fall readily into this dichotomy; some were pentamerous (Montreal, Ottawa, Prince Rupert and Victoria), or tetramerous (Cypress Hills), while some collections (St. John and Hand Hills) were made up of both types.

2. S. saginoides (L.) Karsten -- Small and inconspicuous perennial with a taproot and tending to form a small cushion of basal or near basal filiform leaves. Glabrous. Stems short, only a few cm long, bearing only 1-(3) terminal flowers. Sepals usually scarious-margined. (Mid summer?) Wet open ground in alpine habitats; rare or overlooked: Rockies. -- (G)-F, (Y)-Aka, L-NF, NB-Q, Alta-BC, US, Eur.

Not to be confused with the somewhat similar species of Arenaria. The latter are glandular-puberulent at least on the peduncles.

3. S. nodosa (L.) Fenzl var. nodosa -- Bulbiferous, the bulblets small, usually about 1 mm long and mostly made of a cluster of 4 fleshy leaflets. Short-lived perennial, glabrous or slightly glandular-puberulent at the top of the pedicel. Rosette leaves long filiform, much longer than the stem leaves. Bulblets few to numerous, terminal or axillary, often replacing the flowers. Flowers few, terminal. Summer. Sandy or rocky shores of large bodies of water. -- (G-K)-Mack, (L)-NF, NS-S-(Alta), US, Eur.

Further east, and primarily in maritime regions, there occurs a var. pubescens Mert. & Koch, more or less glandular-puberulent, at least on the pedicels.

4. S. nivalis (Lindl.) Fries var. caespitosa (J. Vahl) Boivin (S. caespitosa (J. Vahl) Lange) -- Similar to S. saginoides, but generally smaller and the sepals usually with a deep purple border. Inconspicuous short-lived perennial, 1-2 cm high, tufted from a dense rosette. Glabrous. Stems short, usually shorter than the rosette leaves, bearing a single flower on a long pedicel. (Early summer?). Arctic shores and polygonic soils. -- G-K, L, nQ, (nMan, US), Eur.

Var. nivalis is more widely distributed in arctic regions; it is a taller plant, the upper part of the stem overtopping the basal foliage.

4. ARENARIA L.

SANDWORT

Stypes mostly 3 and fewer than the 5 sepals as in Stellaria, but the petals entire, as in Sagina. Capsule opening by 3 entire or bifid valves.

- a. Leaves with a well developed limb Group A
- aa. Limb very narrow Group B

Group A

Limb narrowly lanceolate to broadly ovate, more than 1 mm wide.

- a. Inflorescence bracts very small, scarious-margined.
 - b. Sepals obtusish to rounded; leaves pilose below along the midnerve 5. A. lateriflora
 - bb. Sepals somewhat acuminate; leaves glabrous below 6. A. macrophylla
- aa. Inflorescence leafy or the leaves gradually reduced to green and leaf-like bracts.
 - c. Glabrous and very fleshy sea-coast plant 12. A. peploides
 - cc. Little if at all fleshy, and at least the pedicels puberulent.
 - d. Annual; puberulent throughout ..
 - 1. A. serpyllifolia
 - dd. Perennial; leaves glabrous 2. A. humifusa

Group B

Leaves linear or subulate to filiform, usually 0.5-1.0 mm wide.

- a. Sepals obtuse or more often rounded at summit.
 - b. Leaves 1-6 cm long.
 - c. Inflorescence glandular 3. A. capillaris
 - cc. Glabrous 4. A. congesta
 - bb. Leaves 1 cm long or less 7. A. laricifolia
- aa. Sepals clearly acute to acuminate.
 - d. Leaves spinescent and recurved 11. A. Nuttallii
 - dd. Leaves not spiny, straight and more appressed.

- e. Flowers 2 or more in a cymose inflorescence.
- f. Usually glabrous; most stem-leaves subtending an axillary fascicle...8. A. stricta
- ff. Glandular-puberulent at least in the inflorescence; axillary fascicles few or none 10. A. verna
- ee. Flowers solitary, terminal.
- g. Sepals pale green 8. A. stricta
- gg. Deep red 9. A. Rossii

1. A. SERPYLLIFOLIA L. -- Sandweed -- Annual. Densely puberulent, retrorsely so on the internodes, slightly scabrous and usually many-stemmed. Leaves ovate, subsessile, less than 1 cm long. Petals half as long as the sepals. Inflorescence elongating in fruit, often becoming somewhat racemose with the fruits more or less alternate. Late spring to early summer. Rare weed of cultivated fields: Kamsack, Tisdale. -- NS-O, S, BC, US, Eur.

2. A. humifusa Wahl. (A. cylindrocarpa Fern.) -- Capsule deep brown above. Peduncle and upper part of stem finely puberulent. Small, matted, stoloniferous and slightly fleshy perennial. Leaves small, lanceolate to ovate. Flower solitary, terminal. Early summer. Coastal sands and gravels. -- (G-F)-K-Mack-(Y)-Aka, (L)-NF-(SPM), Q, nMan, (Alta-BC, Eur).

3. A. capillaris Poir. var. americana (Maguire) Davis (A. formosa AA.) -- Leaves longest, the lower ones mostly 2-4 cm long. Glabrous below, finely glandular above. Densely tufted with the leaves mostly near the base. The numerous and sparsely leafy stems 1-2 dm high. Cyme often corymbiform with the lateral pedicels successively much shorter. First half of summer. Montane and low alpine grassy slopes and rock slides. Rockies. -- swAlta-BC, nwUS.

The more northern typical variety is glabrous in the inflorescence.

4. A. congesta Nutt. var. lithophila (Rydb.) Maguire (var. prolifera Maguire; A. lithophila Rydb.) -- Much resembling the preceding, but glabrous, except for the finely ciliate lower leaves. Inflorescence more congested. Pedicels tending to be shorter than the flowers. Late spring and early summer. Dry montane prairies: Cypress Hills, Sweetgrass Buttes and southward. -- swS-seAlta.

South of us, the typical variety has a still more congested inflorescence, the flowers being sessile or nearly so.

5. A. lateriflora L. (Moehringia lateriflora (L.) Fenzl) -- Commonly a simple herb with a single seemingly lateral inflorescence. Long stoloniferous and forming large loose colonies. About 1 dm high and nearly always with 1-(2) inflorescences which arise terminally but usually appear to be lateral due to the growth of a single branch from one of the upper axils. Leaves elliptic to narrowly lanceolate, more or less pubescent, at least ciliate at margin and densely pilose below along the mid-nerve. Inflorescence bracteolate, with 1-3 flowers. Sepals

2-3 mm long, rounded at tip. Late spring and early summer. Very common forest species. -- seK-Aka, L-SPM, NS-BC, US, Eur.

6. A. macrophylla Hooker (Moeshringia macrophylla (Hooker) Torrey) -- Resembling the preceeding, but with larger flowers. Leaves commonly larger and more acute, sometimes scaberulous at margin and minutely puberulent above along the midnerve, otherwise quite glabrous. Sepals 3.5-4.5 mm long, \pm acute. Late spring. Dry, open, rocky places, rare -- Mack, L, Q-O, nS, BC, US, (Eur).

7. A. laricifolia (L.) Rob. var. occulta (Ser.) Boivin -- (A. arctica Steven; A. obtusiloba (Rydb.) Fern.; A. sajanensis W.) -- Sepals obtuse and somewhat cucullata at tip. Loosely to densely tufted perennial. Glandular-puberulent above and usually nearly glabrous below, but at least the leaves ciliolate. Flowers small to large, tending to be solitary. Petals as long as, to longer than, the sepals. Mid summer. Forming small to large mats on rock slides and exposed alpine habitats. -- F-Aka, swAlta-BC, nwUS, Eur.

In our variety the upper leaves and bracts are normally glabrous or ciliate. The typical phase of southern Europe tends to be larger, laxer, and its bracts and upper leaves are as densely puberulent or glandular as the rest of the inflorescence.

8. A. stricta Mx. var. litorea (Fern.) Boivin (A. dawsonensis Britton; A. uliginosa Schleicher; Sabulina dawsonensis (Britton) Rydb.) -- Loosely tufted perennial with narrow leaves and numerous axillary tufts; the very open inflorescence occupying most of the height of the plant. Glabrous throughout. Usually 1-2 dm high. Leaves mostly 1-nerved or sometimes weakly 3-nerved. Pedicels very unequal, the central one being $1\frac{1}{2}$ -2 times as long as the lateral. Sepals 3-5 mm long. Petals included. Early to mid summer. Cliffs and dry, open places. -- (seK-Aka), L-(NF), Q-Alta-(BC, ncUS) -- Var. puberulenta (Peck) C.L. Hitchc. (A. tenella Nutt.) -- Somewhat glandular-puberulent in the inflorescence. Reported for southwestern Alberta. -- (swAlta)-BC, nUS -- Var. uliginosa (Schleicher) Boivin (A. uliginosa Schleicher) -- Generally smaller and fewer-flowered. Glabrous. Foliage mostly restricted to the lowest 1-2 cm. Pedicels subequal or solitary. Sepals 2.5-3.0 mm long, acute at summit. First half of summer. Wetter spots in arctic tundra. -- (G)-F-K-(Mack-Aka, L), Q-nMan, (Eur).

Not to be confused with certain similar species of Sagina. The latter have more numerous styles and valves and the sepals are rounded at tip.

Our three varieties are usually treated as species, but we find that they are very closely related and intergrade to some extent.

9. A. Rossii Br. var. columbiana Raup -- Forming dense cushions pinned with numerous solitary white flowers with red sepals. Glabrous. Leaves 2-5 mm long. Pedicels usually reddish and commonly short, rarely up to 2 cm long. Flower terminal. Petals somewhat shorter than the deep red sepals. Mid summer. Alpine rock slopes. -- Mack-Y, (swAlta)-BC, (nwUS) --

Var. apetala Maguire -- Petals lacking or very small and very narrow, less than half as long as the sepals -- (Y), swAlta-eBC, (nwUS).

10. A. verna L. (A. rubella (Wahl.) Sm.; Sabulina propinqua (Rich.) Rydb.) -- Rather resembling a small A. stricta. Smaller, less than 1 dm high. Glandular-puberulent throughout or at least above. Leaves 3-nerved, the lateral nerves often nearly as strong as the middle one. Stem leaves bearing few, if any, axillary fascicles. Pedicels shorter, not exceeding 1.5 cm long. Summer. Dry and open montane or alpine places in the Rockies and Cypress Hills; also northward in subarctic and arctic regions. -- G-Aka, L-NF, Q-BC, US, Eur.

The phenotype with the petals shorter than the sepals is commonly segregated as A. rubella.

The Bell collection from York Factory (QK; DAO, photo) has been revised to A. stricta var. uliginosa.

11. A. Nuttallii Pax var. Nuttallii -- Leaves divergent-falcate and ending in a sharp spinescent point. Otherwise resembling A. stricta by its inflorescence and acute sepals, but A. laricifolia by its mode of growth and densely carpeting habit. Densely glandular-puberulent throughout. Mid nerve very strong, nearly half as wide as the whole leaf. Sepals usually acuminate into pungent tips. First half of summer. Talus slopes in the mountains -- (swAlta)-BC, wUS.

Three other varieties are known to occur further south. The series may be keyed out as follows:

- a. Petals included, shorter than the sepals.
 - b. Leaves falcate and mostly 1 cm long or slightly less var. Nuttallii
 - bb. Straight and shorter, 5-8 mm long ..
 - var. gracilis (Gray) Rob.
- aa. As long or longer than the sepals.
 - c. Sepals 3.5-4.5 mm long....var. gregaria (Heller) Jepson
 - cc. Flowers larger, the sepals 5.5-6.5 mm long, the petals about as long ..
 - var. fragilis (Mag. & Holmgr.) C.L. Hitchc.

12. A. peploides L. var. diffusa Horn. -- A very fleshy maritime plant. Stoloniferous and forming a loose carpet of stems 1 dm high or less. Glabrous. Leaves with a paler and finely crenulate margin. Fruit large, solitary, globular, somewhat less than 1 cm across. First half of summer. Sandy or gravelly beaches at high tide level. -- G-nMack-(nY)-nAka, L-NF, nQ-nMan.

Provided the Old World variations are ignored, our american specimens can be readily divided into three fairly satisfactory geographical varieties: a smaller and more northern var. diffusa, a larger west coast var. major Hooker, and a fleshier and more leafy east coast var. robusta. However the european material is also very variable and we do not see clearly how to relate the typical and other transatlantic material to our cisatlantic va-

riations. We have therefore ignored all the paleogeographic material in our statements of distributions. Not a very satisfactory solution intellectually, but the only practical one in the present stage of our knowledge.

5. SPERGULA L.

SPURREY

Stipules present. Otherwise much as in *Sagina*, with 5 sepals, 5 styles and entire petals. Capsule dehiscent by 5 valves.

1. *S. ARVENSIS* L. (var. sativa (Boern.) Rchb.) -- Povertyweed, Spurrey (Grippe, Herbe de poudre) -- Filiform leaves numerous, seemingly verticillate, but actually opposite and subtending axillary fascicles. Annual, glabrous to glandular, usually many-stemmed. Inflorescence leafless, merely bracted. Pedicels becoming reflexed right after flowering, the full grown plants thus tangling very readily. Summer and fall. Infrequent weed of crops and waste places: Edmonton region; more doubtfully elsewhere. -- G, sMack-Y-(Aka), NF-SPM, NS-O-(Man-S)-Alta-BG, US, SA, Eur.

Var. sativa is often distinguished rather arbitrarily as a more glandular type with non-papillose seeds. The nomenclature of the distinction is unsound as var. sativa is based on the same type as *S. arvensis*.

6. SPERGULARIA J. & C. Presl

Stipules present. Otherwise much as in *Arenaria*, with 5 sepals but only 3 styles and the petals entire. Capsule dehiscent by 3 valves.

1. *S. marina* (L.) Gris. (var. leiosperma (Kindb.) Gürke; *S. diandra* (Guss.) Boiss.; *S. salina* J. & C. Presl; *S. sparsiflora* (Green) Nelson) -- Each pair of leaves with only one pair of deltoid stipules. Annual, glandular-puberulent and viscid throughout. Leaves linear with few, if any, axillary fascicles. Inflorescence leafy, imperfectly cymose, tending to become racemose. Fruiting pedicels mostly reflexed. Petals much shorter than the sepals and often pinkish. Seeds variable, less than 1 mm wide, brown to blackish, smooth to papillose, sometimes with a peripheral wing. Summer. Native on alkaline shores; sporadically weedy. -- sMack, (NF)-SPM, NS-BC, US, (CA, SA), Eur, (Afr).

7. AGROSTEMMA L.

Calyx lobes prolonged into leaf-like appendages. Similar to *Lychnis*, but the 5 styles opposite the petals.

1. *A. GITHAGO* L. -- Corn-Cockle, Corn-Campion (*Nielle des blés*) -- Calyx lobes very long, overtopping the petals, similar to the leaves and about half as long as the latter. Densely strigose annual, stiffly erect. Leaves long-linear. Flower large and showy, purple red, on a very long peduncle. All sum-

mer. Old fashioned weed of cereal crops, now practically eliminated. -- (Aka), NS-PEI-(NB)-Q-S, BC, US, Eur.

8. SILENE L.

CATCHFLY, CAMPION

Styles only 3, otherwise as in Lychnis. Capsule dehiscent by 6 teeth.

a. Stemless and forming compact cushions 7. S. acaulis
aa. Stem elongate and obvious.

b. Calyx densely glandular-pubescent.

c. Calyx less than 1 cm long 9. S. Menziesii

cc. Larger, clearly over 1 cm long.

d. Calyx with about 35 nearly equal

longitudinal nerves 1. S. conoidea

dd. With 10 nerves only.

e. Weedy annual 3. S. noctiflora

ee. Native perennial with shorter

calyx lobes 8. S. Scouleri

bb. Calyx glabrous except for the ciliate lobes.

f. Calyx up to 8 mm long, with

10 simple nerves.

g. Inflorescence a dense thyrse 6. S. sibirica

gg. Flower few in an open

cyme 2. S. antirrhina

ff. At least 10 mm long, with \pm 20 main

nerves.

h. Calyx nerves strongly reticulate

above the middle 4. S. Cucubalus

hh. Nerves weakly branched and

barely reticulate 5. S. Cserei

1. S. CONOIDEA L. -- Calyx conic-lanceolate at flowering. Annual, viscous-glandular throughout. Calyx 2-3 cm long, with about 30-35 nerves, the internerves membranous, the lobes \pm 1 cm long. Petals purple, large. Capsule pyriform. Mid summer. Rare weed of field crops and elevator areas: Lacombe. -- Alta, (US), Eur.

2. S. antirrhina L. -- Sleepy Catchfly -- The upper internodes with a heavy glutinous zone; these zones at first pale green, soon turning purple-black and becoming very conspicuous. Thin and wiry annual, glabrous above, retrorse-scaberulous below, the leave scaberulous at margin. Calyx 6-8 mm long, with ciliolate lobes. Early summer. Open sandy places. -- NB-BC, US, (CA, SA, Eur).

Frequent from Roche-Percée eastward and it may also be common across the northern parts of our area, but as of yet we have seen only two other collections from west of Manitoba: Lake Athabaska and Fort Chippewyan.

3. S. NOCTIFLORA L. -- Sticky Coockle (Fleur de nuit) -- Large white flowers snowy in the evening, closed and inconspicuous in the daytime. Annual, glandular-pubescent throughout. Leaves \pm lanceolate. Calyx 2.0-2.5 cm long, the lobes nearly

1 cm long. Early to mid summer. Crop fields and roadsides. -- (G), Aka, NF, NS-BC, US, Eur.

Not to be confused with Lychnis Loveae. The latter is a perennial with shorter calyx lobes.

4. S. CUCUBALUS Wibel var. CUCUBALUS (S. latifolia (Miller) Britton & Rendle; S. vulgaris Garcke) -- Blaadder-Campion, Maiden's Tears (Pétards, Péteux) -- Calyx with \pm 20 main nerves and strongly reticulate above the middle. Nearly glabrous perennial, 3-8 dm high. Leaves \pm lanceolate, commonly 1-2 cm wide. Inflorescence variable, usually cymose. Calyx lobes tomentulose at tip. Summer. Infrequent weed of cultivated ground, roadsides and waste places. -- NF, NS-BC, US, Eur.

Many authors prefer S. vulgaris but as pointed out by Hitchcock 1964, this was based on the illegitimate Behen vulgaris and the epithet vulgaris takes date only from the legitimate publication of Silene vulgaris Garcke 1869. See the note under Art. 72 of the Code. S. Cucubalus Wibel 1799 is much earlier as a legitimate epithet. Hence our nomenclatural choice.

European authors often recognize a wide selection of variants. One of them, var. latifolia (Rchb.) Beck from Central Europe, has been reported as introduced south of our borders. It is a generally larger plant with leaves 2-3 cm wide and calyces 1.5-2.0 cm long.

This and the next are quite obviously different in the field, but when we came to write our key, we were surprised to find how difficult it is to select a convenient and reliable key character. This awkwardness in communicating one's knowledge in writing does not in any way impair the distinctiveness of the two entities.

5. S. CSEREI Baumg. -- Much like the preceeding, but biennial, larger, more fleshy, glaucous and with a conspicuous fork in the inflorescence. Showy, 5-15 dm high. Leaves elliptic, to lanceolate, mostly 2-4 cm wide. The two main branches of the inflorescence 1-3 dm long and bearing their flowers somewhat laterally. Early summer. Open ground, mainly on railway cinders, and still spreading rapidly. -- Q-BC, US, Eur.

6. S. SIBIRICA (L.) Pers. -- All stem leaves subtending copious axillary fascicles. Tufted perennial, more or less scabrous, especially the leaves. Flowers numerous in a rather dense, elongate inflorescence. Calyx small, about 5 mm long. Fruit stipitate, the stipe about $1\frac{1}{2}$ mm long. (Early summer?). Local weed of cultivated fields, invading grasslands. -- cS, eEur.

Known from Maymont, Duck Lake, Bladworth, Nokomis and Bethune.

7. S. acaulis L. var. excapa (All.) DC. -- Formind dense cushions in alpine habitats and very conspicuous when speckled with flowers. Perennial with a strong taproot and a tightly branched caudex. Flower purple, solitary, borne just above the cushion on a short peduncle. Early summer. Rocky tundra and talus slopes: Rockies and lake Athabaska region. -- G-Aka, L-SPM, eNS, Q, nWS-sWAlta-BC, US, Eur.

Divisible into three intergrading varieties, the typical one being eurasian. In ours the calyx is 3-6 mm long and mostly longer than its peduncle. In the more western var. subacaulescens (F.N. Williams) Fern. & St. John in the larger calyx is commonly 7-10 mm long and usually shorter than its peduncle. We must admit that we find much of the Yukon and Alaska specimens to be rather intermediate.

8. S. Scouleri Hooker var. Scouleri -- Native alpine species similar to some species of Lychnis. Tufted perennial, glandular-viscous above, reflexed-puberulent below, mostly 3-4 dm high. Leaves up to 5-10 mm wide. Flowers clustered, on pedicels rarely over 1 cm long shorter than the calyces. Calyx 10-15 mm long, the lobes 2-4 long. Early summer. Montane prairies. -- swAlta-swBC, nwUS -- Var. Macounii (Watson) Boivin (S. Parryi (Watson) Hitchc. & Mag.) -- Smaller, mostly 2-3 dm high. Leaves 2-5 mm wide. Pedicels variable, the one of the terminal flower 1-3 cm long. -- swAlta-sBC, nwUS.

9. S. Menziesii Hooker var. Menziesii -- Second smallest species. Stoloniferous, 1-3 dm high, glandular-pubescent out. Leaves narrowly to broadly oblanceolate. Flowers few, small. Calyx only 5-9 mm long, the nerves inconspicuous. Capsule purple-black. Late spring to early summer. Wooded ravines and shores, rarely weedy. -- sMack-Y-(Aka, wdMan)-sS-BC, US.

To the southwest of us there is a var. Dorrii (Kellogg) stat. n., S. Dorrii Kellogg, Proc. Cal. Ac. 3: 44, 1863, with the glandular pubescence of the lower part of the stem much shorter, minute, and much more sparse. And to the northwest a var. Williamsii (Britton) Boivin which differs mainly by its larger calices, 9-11 mm long.

A mention of S. dichotoma Ehrh. by Budd 1957 and 1964 was apparently based on R.E. Anderson, Melfort, Sask., July 18, 1951 (SCS: DAO, photo), but this sheet is a specimen of Lychnis Loveae.

9. LYCHNIS L.

CAMPION

A basic type with fused calyx but free petals. Styles normally 5, alternate with the petals. Calyx with 10 main nerves.

Treatment approximate as most of our specimens are on loan to a specialist at the moment.

a. Leaves more than 1 cm wide.

b. Flowers red in a compact inflorescence ..

..... 2. L. chalconica

bb. Flowers white in a very open cyme 1. L. Loveae

aa. Leaves narrower, 7 mm wide or less.

c. Flowers nodding, purple.

d. Calyx 2-3 times as long as

wide 5. L. attenuata

dd. Calyx ovoid to subglobular 6. L. apetal

cc. Flowers erect, white.

SILENE

- e. Flowers closed and the petals included
in the daytime 4. L. pudica
ee. Flowers open and the petals well exerted
in the daytime.
f. Calyx 8-10 mm long 3. L. Drummondii
ff. Calyx 10-13 mm long 7. L. triflora

1 X. L. LOVEAE Boivin (L. alba AA.; Melandrium album AA.)--
White Campion, White Cockle (Compagnon blanc, Passe-jacée) --
Flowers showy, open in daytime, closed at night. Coarse and
sticky perennial with a widely diffused inflorescence. Calyx
at first cylindric, then distended by the fruit and becoming
nearly globular. Calyx lobes 3-6 mm long. Petals white. Sum-
mer. Roadsides and cultivated fields; a hybrid of L. alba X
rubra, escaped from cultivation. -- Aka, NS-BC, US, Eur.

Seems clear that our plant is not the european L. alba,
white-flowered and opening at night, but rather a garden hybrid
of L. alba X dioica. The L. dioica parent is red-flowered,
opening in the daytime, while our plants are white-flowered and
open in the daytime.

A report of Silene dichotoma Ehrh. by Budd 1957, 1964, was
based on a collection of Lychnis Loveae from Melfort (SCS; DAO,
photo).

2. L. CHALCEDONICA L. -- Scarlet Lychnis, Maltese Cross
(Croix de Jérusalem, Lampette de Calcédoine) -- Flowers brick-
red in a compact corymbiform cyme. A coarse hirsute perennial.
Capsule long-stipitate, the stipe at least half as long as the
body of the fruit. Mid summer. Sometimes cultivated and tend-
ing to escape to nearby ditches and fields. -- PEI, Q-S, BC,
(US, Eur).

3. L. Drummondii Watson var Drummondii (L. affinis AA.;
Wahlenbergella Drummondii (Watson) Rydb.) -- Similar to Silene
Scouleri but with 5 styles, and the calyx shorter. (Early sum-
mer?). Alpine habitats. Reported for the Rockies of Alberta,
but these reports are doubtful and may be based on a Silene or
on the following species. -- (swAlta), US.

Two of Watson's specimens have been examined. One from
Weber Valley, Utah (HUH), has white and exerted petals; it is
considered typical of the species. The other is from Uintas
(HUH) and has the characteristic purplish petals of the follow-
ing variety.

L. Drummondii Watson var. heterochroma var. n. Petalis
exsertis, lamina purpurea. Type: C.L. Porter 4650, Medicine
Bow Mountains near Keystone, 9000 ft., July 14, 1948 (DAO). Pa-
ratypes from Wyoming, Utah and Colorado.

See the next species for more on the typification of this
name.

4. L. pudica Boivin (L. Drummondii AA.; Wahlenbergella
Drummondii AA.) -- Calyx closed and the petals included in day-
time. A rather inconspicuous perennial, virgate, 3-6 dm high,
glandular-puberulent. Flowers few, opening at night. Calyx
cylindric. Seed small and wingless. Petals white, slightly

exserted at night. Late spring to mid summer. Steppes, prairies and Pine woods. -- (Mack), Man-BC, US.

L. Drummondii Watson -- As a doubtful synonym Watson cited Silene Drummondii Hooker and the two names are usually treated as synonyms but two quite different species are actually involved. Watson was quite aware of discrepancies between the two taxa and in his text he pointed out differences between his Lychnis and Hooker's Silene. Since Watson expressed a clear doubt about the synonym he quoted, it seems best that Watson's name be typified by the specimens which he had at his disposal. These belong to the Rocky Mountain element of the western U.S. for which the name is currently used. This is the Silene-like type with conspicuous petals. The other element is the L. pudica of our text.

5. L. attenuata Farr (L. apetala L. var. attenuata (Farr) C.L. Hitchc.) -- Similar to the following and often confused with it. Petals slightly exserted. Pubescence sometimes purplish throughout, but usually white throughout except on the calyx nerves. Stem lower, 5-10 cm high. Calyx narrower, narrowly ovoid to narrowly ellipsoid. Mid summer. Alpine rock slides: Rockies. -- swAlta-seBC -- F. glabra (Regel) Boivin -- Herbage glabrous. -- (swAlta).

6. L. apetala L. var. arctica (Fries) Cody -- Flower nodding, the petals included. Perennial, 0.5-2.0 dm high, not viscus, but with purplish pubescence. Flower terminal, nearly always solitary. Petals purple. Calyx ovoid to subglobose, erect in fruit. Seed broad, with a large inflated wing. (Early summer?). Wet tundra and shores of arctic streams. -- (G)-F-Mack-(Y)-Aka, (nL), nQ, nMan.

In the eurasian var. apetala the petals are white and a bit longer, almost exserted.

7. L. triflora Br. var. elatior (Regel) Boivin (L. affinis AA.; L. Gillettii Boivin) -- Very glutinous tufted perennial. Glandular pubescent throughout. Mostly with 3 flowers on elongate pedicels. Flowers white and open in the daytime and the calyx \pm oblong. Seed over 1 mm wide, with an inflated wing. (Early summer?). Arctic gravels. -- (F-K)-Mack-Aka, nO-nMan.

In the more widely distributed and more northern var. triflora the calyx is bigger, 1.2-1.5 cm long, and the seeds smaller 1.0-1.2 mm wide. Specimens from northern Manitoba, including those reported as L. affinis, have a calyx only 0.8-1.2 mm long but the seeds 1.2-1.8 mm wide and belong to var. elatior.

The application of the name L. triflora was discussed by Boivin 1959.

A report of Melandrium affine (J. Vahl) Hartm. from the Rockies of Alberta by Porsild 1959 has not been investigated.

10. GYPSOPHILA L.

Similar to Saponaria but the capsule dehiscent by 4 valves instead of 4 teeth.

a. Petals \pm 1 cm; annual 3. G. elegans
LYCHNIS 98

aa. Much smaller, perennial.

b. Inflorescence glabrous 1. G. paniculata

bb. Densely glandular 2. G. acutifolia

1. G. PANICULATA L. -- Baby's Breath (Oeillet d'amour)-- Tall perennial with a diffusely branched inflorescence of numerous small flowers. Commonly 5-8 dm high and glabrous throughout or at least in the inflorescence. Stem strongly inflated at the nodes. Sepals petaloid, with a large purple midnerve and broad white margins. Petals white, 2-3 mm long, slightly exceeding the sepals. Mid summer to early fall. Cultivated and sometimes invading adjacent grassland in great numbers. -- Q-sManseBC, US, Eur.

2. G. ACUTIFOLIA Fischer (G. perfoliata var. latifolia AA.) -- Similar to the preceding but glabrous below while glandular-puberulent in the inflorescence. Leaves larger and thicker. Calyx somewhat petaloid. Petals deep pink, about 5 mm long. Mid to late summer. Local escape from cultivation: Calgary. -- Alta, (Eur).

Our specimens seem to fit the description in the Fl. URSS. 7: 757-8. 1936 except for the flower colour. However we notice that Fournier 1952 describes the flowers as being indifferently white or pink.

3. G. ELEGANS Bieb. -- Smaller annual with larger flowers. Glabrous throughout, 2-5 dm high. Calyx greenish with white margins. Petals white, up to 1 cm long. Summer. Cultivated and sometimes reseeding itself on roadsides and waste places: Hoosier, Edmonton, Ft. Sask. -- (Aka), Q,swS-Alta, (US, Eur).

11. DIANTHUS L.

Calyx closely subtended by 1-3 pairs of leafy bracts. Otherwise similar to Saponaria.

a. Leaves 7-20 mm wide 1. D. barbatus

aa. Only 2-4 mm wide 2. D. sylvestris

1. D. BARBATUS L. -- Sweet William, French Pinks (Jalousie, Oeillet de poète) -- Inflorescence congested into a compact terminal corymbiform cyme as in Lychnis chalcidonica, but the latter is hirsute with scabrous leaves. Glabrous except for the finely ciliate or scabrous-margined leaves and bracts. Inflorescence somewhat involucreted with spinescent leaves. Bracts long-attenuate into a long stiff point. Petals white to pink, drying dark red. First half of summer. Cultivated and a casual roadside weed: Morden, Mossy Portage, Waterton. -- Q-O-(Man), Alta-BC, US, Eur.

2. D. SYLVESTRIS Wulfen -- Wood-Pink (Oeillet sauvage) -- Flower solitary or only 2-3 together. Bracts 1/4 to 1/3 as long as the glabrous calyx. Calyx with 20-40 nerves. Flower pink, showy. Late summer. Cultivated and rarely becoming weedy: Fort Saskatchewan. -- cAlta, (Eur).

12 SAPONARIA L.

SOAPWORT

Similar to Lychnis and Silene, but the styles normally only 2 and the capsule opening by 4 teeth. Calyx with 5 or 20 longitudinal nerves.

- a. Calyx cylindric, with 20 nerves 1. S. officinalis
 aa. Calyx wing-angled on the 5 nerves 2. S. Vaccaria

1. S. OFFICINALIS L. -- Bouncing Bet, Soapwort (Herbe à savon, Savonnière) -- The large leaves rather clearly 3 nerved. Quite showy perennial, 5-8 dm high, stoloniferous and forming large colonies. Hirsute in the inflorescence, glabrous below. Calyx cylindric, slightly asymetric, with two lobes almost completely fused and one sinus more deeply cut than the others. Flowers usually pink, often double. Summer. Cultivated and sometimes invading banks and roadsides. -- NS-BC, US, Eur.

2. S. VACCARIA L. (Vaccaria segetalis (Necker) Garcke; V. vulgaris Host) -- Cowherb, Cow-Cockle (Blé de vache, Herbe au veau) -- Calyx produced into 5 deep green, winged ridges, with each of the 5 nerves running on the top of a ridge. Glabrous and slightly glaucous annual with connate leaves. Inflorescence very open. Petals pale to deep pink. Summer. Casual weed in grain crops and around elevators. -- Y-(Aka, NS, NB-Q)-O-Alta-(BC, US), Eur -- F. GROHII Boivin -- Flowers white. Local. -- Man-S.

75. PORTULACACEAE

(PURSLANE FAMILY)

Rather unusual family by having only 2 sepals or only 2 calyx lobes. Other floral parts are in 3's, or 4's or 5's. Otherwise resembling the Caryophyllaceae.

- a. Stem very branchy 2. Portulaca
 aa. Stem simple or nearly so, or the plant scapose.
 b. Stem leafy 1. Claytonia
 bb. Leaves all basal, the scapes merely bracteolate 3. Lewisia

1. CLAYTONIA

SPRING-BEAUTY

Sepals 2, persistent, enveloping the 3-valved capsule.

- a. Leaves alternate.
 b. Leaves ovate to lanceolate 1. C. parviflora
 bb. Leaves linear.
 c. Annual; petals white 3. C. linearis
 cc. Perennial with superficial leafy stolons; petals pink, larger 2. C. Bostockii
 aa. Leaves opposite.
 d. Leaves mostly basal; the root a huge taproot 6. C. megarrhiza
 dd. All or mostly cauline.
 e. Leaves only two 5. C. caroliniana

ee. More numerous and many times

smaller 4. C. fontana

1. C. parvifolia Moç. (Montia parvifolia (Moç.) Greene) -- The tufted stems elongate and becoming very thin towards the tip. Basal leaves numerous, fleshy. Stem leaves remote, narrower and rapidly much smaller. Old stems decumbent and rooting at the nodes. Flowers pink, few, in a terminal raceme which is often congested into an umbel. Summer. Wet rocks below timberline: Waterton. -- seAka, swAlta-BC, wUS.

2. C. Bostockii Pors. -- Resembling the following, but perennial with leafy superficial stolons. Petals pink, \pm 1 cm long. Wet places. (Spring?). Reported for northern Manitoba. -- Y-Aka, (nMan).

3. C. linearis Douglas (Montia linearis (Douglas) Greene; Moniastrum lineare (Douglas) Rydb.) -- Annual with 2-3 long-linear leaves. Sometimes tufted or with 1-2 branches. Petals white, about as long as the sepals. Late spring. Wet mossy places in the mountains; Cypress Hills and Twin Butte. -- swS-BC, US.

4. C. fontana (L.) R.J. Davis (Montia lamprosperma Cham.) -- Blinks, Indian Lettuce (Petit cresson) -- A small and slightly fleshy herb with opposite and oblanceolate leaves mostly \pm 1 cm long. Shallow-rooted annual in tangled colonies. Leaves ternate, the two lateral nerves submarginal, meeting at the tip of the leaf and anastomosing with the median. Flowers few or solitary, on strongly arched peduncles. Summer. Cold springs in maritime regions: Churchill. -- (G-F)-K-(Mack), Aka, (L-SPM, NS-NB)-Q-nMan, BC, US, (CA, SA), Eur, (Afr, Oc).

5. C. caroliniana Mx. var. lanceolata (Pursh) Watson -- Tufted herb from a deeply buried corm. Stem bearing two sessile, lanceolate leaves and a terminal raceme of delicate flowers. Petals white to pink, about 1 cm long. Late spring and early summer. Mountain meadows and coniferous forests: Cypress Hills and Rockies. -- swS-BC, nwUS.

Many other varieties are known. The following occur in the western U.S.A.: var. sessilifolia Torrey has longer and narrower leaves; var. flava (Nelson) stat. n.; C. flava Nelson, Un. Wyo. Publ. Bot. 1: 142. 1926 has orange yellow flowers; var. chrysantha (Greene) stat. n., C. chrysantha Greene, Leaflet Bot. Obs. Crit. 2: 45, 1910 also has yellow flowers but broader leaves; var. Peirsonii (Munz & Johnston) stat. n., C. lanceolata Pursh var. Peirsonii Munz & Johnston, Bull. Torr. Bot. Club 49: 352. 1923 has a foreshortened and umbelliform inflorescence.

6. C. megarrhiza Parry -- Densely tufted herb from a huge taproot. Basal leaves numerous and crowded, suborbicular to obovate. Stem leaves petiolate, narrower. Inflorescence \pm overtopping the leaves. Petals white, nearly 1 cm long. Mid summer. Alpine summits and rock slides: Rockies -- swAlta-BC, wUS.

2. PORTULACA L.

PURSLANE

Ovary semi-inferior. Capsule circumcissile.

1. P. OLERACEA L. -- Purslane, Pusley (Pourpier sauvage, Porcelaine) -- A very fleshy weed with the stem and branches spread out on bare ground. Very antagonistic to the usual herbarium-making processes; gradually shedding its leaves, resisting for about a month and turning into a brittle blackened skeleton before giving up. Leaves alternate, spatulate. Main branches tending to be subopposite. Flowers, small, yellow. Late summer. Infrequent weed of bare ground, gardens and cultivated crops. -- NS-(PEI)-NB-BC, US, Eur.

3. LEWISIA Pursh

Ovary superior. Sepals persistent. Capsule circumcissile and also dehiscent at top.

1. L. pygmaea (Gray) Rob. var. pygmaea -- A rosette of somewhat fleshy, long-linear leaves arising from a fleshy taproot. Scapes with two opposite bracts and long overtopped by the leaves. Petals white to pink, up to 1 cm long. First half of summer. Alpine meadows in Waterton. -- swAlta-BC, US.

To the southwest of us it grades into a var. nevadensis (Gray) Fosberg with longer sepals, 5-12 mm long, and usually larger leaves.

Order 43. POLYGONALES

A reduced type from the Caryophyllales, the fruit being reduced to a single seed. Flower typically 3-merous.

- a. Leaves alternate or verticillate 76. Polygonaceae
 aa. Leaves opposite 77. Illecebraceae p. 117

76. POLYGONACEAE (BUCKWHEAT FAMILY)

Most genera in this family have large stipules united into a cylindric sheath at each node. This sheath is termed "ocrea". Petals lacking, but the sepals often petaloid. Fruit an achene.

- a. Leaves all basal or essentially so.
 b. Flowers in clusters subtended by a verticillate involucre 2. Eriogonum
 bb. Panicle not involucred 4. Oxyria
 aa. Stem leafy.
 c. Uppermost leaves in a verticil of about 3 leaves 1. Koenigia
 cc. Leaves all alternate.
 d. Fruit wingless or sometimes the outer tepals winged dorsally 6. Polygonum
 dd. Fruit winged.
 e. Wings formed by the 3 inner and enlarging tepals 3. Rumex

ee. Wings borne directly on the achene, the sepals remaining small.

f. Sepals and stamens 4; wings 2..... 4. Oxyria

ff. Sepals and stamens 6; wings 3..... 5. Rheum

1. KOENIGIA L.

Resembling Polygonum, but the stipules not fused into a sheath and the flowers somewhat reduced. Sepals and stamens 3.

1. K. islandica L. -- Small to minute annual with a pair of basal leaves, one or a few alternate stem leaves and a terminal verticil of usually 3 leaves. Flowers small, mostly in a terminal cluster. Mid summer. Wet and more or less bare ground. -- G-K-(Mack-Y)-Aka, L, nQ, (swAlta-neBC, wUS), Eur.

We have yet seen no specimens from Alberta or B.C. and consider that the reports from those areas are questionable.

2. ERIOGONUM Mx.

UMBRELLA-PLANT

Stipules lacking. Flowers in clusters, each cluster subtended by a cupulate involucre. Clusters often gathered in umbels. Often semi-shrubby.

a. Flower clusters gathered in \pm secund racemes..1. E. cernuum
aa. Inflorescence umbellate.

b. Inflorescence a simple umbel of clusters, subtended by a verticil of reduced bracts.

c. Leaves ovate to suborbicular..... 3. E. ovalifolium

cc. Leaves lanceolate to narrowly linear.

d. Leaves in dense rosettes..... 5. E. androsaceum

dd. Leaves merely subbasal in crowded pairs 2. E. multiceps

bb. Umbel compound and subtended by a verticil of leaf-like bracts.

e. Bracts of the umbel lanceolate and

ascending 4. E. flavum

ee. Bracts spatulate and drooping..... 6. E. umbellatum

1. E. cernuum Nutt. -- Flower clusters on somewhat reflexed pedicels and in \pm secund racemes. Leaves suborbicular, whitish-tomentose below, not so densely tomentose above. Leaves borne in a somewhat elevated rosette with a few alternate leaves below the rosette. Ramification of the inflorescence rather elaborate: first verticillate, then dichotomous, then racemose. Bracts small. Flower clusters small and whitish. Second half of summer. Open sands, rare: Abbey, Webb, Empress, Writing-on-Stone. -- swS-sAlta, US.

2. E. multiceps Nees -- Leaves not quite crowded into a rosette but separated by short internodes and \pm clearly opposite. Grayish-white tomentose throughout. With a woody taproot and a branched caudex, also woody and buried. Leaves oblanceolate to linear, paler below. Inflorescence a simple umbel of clusters. Bracts very small to elongate. Flowers pinkish. First half of

summer. Eroded clays in badlands, where it acts as a soil binder. -- swS, (seBC), ncUS.

3. E. ovalifolium Nutt. -- Silver-Plant -- Forming compact cushions of white leaves. Taproot, branched caudex and marcescent leaves as in the following. Leaves ovate to suborbicular, white-tomentose on both faces. Flowers yellow in a dense umbel, often tinged pink. Mid summer. Talus slopes in the mountains. -- swAlta-seBC, US.

4. E. flavum Nutt. var. flavum -- Much in evidence in early summer on hillsides, a cushion-forming herb with umbells of yellow flowers. Taproot and caudex woody, the caudex branches few and densely clothed with the blackened remnants of old leaves. Leaves lanceolate, white-tomentose below, green and tomentose to villous above. Scape tomentose. Early summer. Near the top of hills, bluffs and coulées. -- swMan-sBC, US -- Var. Piperi (Greene) M.E. Jones (E. Piperi Greene) -- Not quite so densely pubescent: the scape merely villous and the hairs not tangled. Leaves villous above. Not a clear cut variation, but often replacing the type in the mountains: Rockies. -- swAlta-seBC, nwUS.

5. E. androsaceum Benthham -- Forming compact cushions of discolour leaves. Mode of growth as in the preceding, but the leaves smaller, about 1 cm long, linear-oblancoate, white-tomentose below. Scape lower, less than 1 dm high. Inflorescence a simple umbel of clusters. Flowers yellow to deep red. Before mid summer. Alpine rock slides: Rockies. -- swAlta-seBC, nwUS.

6. E. umbellatum Torrey (E. subalpinum Greene) -- The woody caudex creeping on the ground and with obvious internodes, thus a carpet forming species. Leaves broadly oblanceolate, white-tomentose below, green and nearly glabrous above, clustered in numerous rosettes. Scapes 1-3 dm high. Inflorescence compound, subtended by a verticil of spatulate and drooping bracts which are somewhat smaller than the leaves. Flowers yellow. First half of summer. High montane and low-alpine on open rocky ground. -- swAlta-sBC, wUS.

3. RUMEX L.

DOCK, SORREL

Fruit with 3 wings, the 3 inner sepals enlarged and persistent to form those 3 wings. Achene hidden between the wings. Mid-nerve of the wings (or valves) often thickened into a seed-like grain or tubercule. Ocrea conspicuous as in Polygonum. Fruiting pedicel often with a thickening termed "articulation".

a. Fruit very large and showy, 1-3 cm wide..... 1. R. venosus
aa. Fruit much smaller.

b. Flowers dioecious; leaves mostly hastate or sagittate.

c. Leaves long cuneate at base 14. R. paucifolius

cc. Leaves hastate or sagittate.

d. Sepals small, about 1 mm long,

less than 2 mm long in fruit..12. R. Acetosella

- dd. Sepals and valves longer 13. R. Acetosa
- bb. Flowers mostly or all perfect; leaves hardly, if at all, hastate or sagittate, mainly cuneate to cordate.
 - e. Wing margin produced into a few elongated acicular lobes.
 - f. Inflorescence moniliform 10. R. dentatus
 - ff. Inflorescence dense and continuous 11. R. maritimus
 - ee. Wings entire to merely erose or denticulate.
 - g. Pedicel not articulated or the articulation not thickened and ± vestigial.
 - h. Valves without grains... 5. R. occidentalis
 - hh. Each valve with a large grain 7. R. orbiculatus
 - gg. Pedicel with a thickened articulation Group A

Group A

Fruit borne on an articulated pedicel. Flowers all or mostly perfect. Fruit middle-size, without acicular lobes.

- a. Fruit with (1)-3 large grains; each at least 1/5 the width of the valves.
 - b. Usually tufted and ascending at an angle, with all stem leaves subtending a branch or an axillary tuft 2. R. salicifolius
- bb. Tall virgate herbs; axillary tufts and branches none or few and poorly developed below the inflorescence.
 - c. Valves entire to shallowly toothed... 8. R. crispus
 - cc. Valves conspicuously and sharply toothed 9. R. stenophyllus
- aa. Fruit without grains or with only 1 small grain.
 - d. Valves rather cordate, commonly about 4 mm wide 3. R. fennicus
- dd. Valves larger, somewhat reniform and mostly 6-8 mm wide.
 - e. Leaves lanceolate to linear 4. R. longifolius
 - ee. Much broader, triangular-cordate ..
..... 6. R. confertus

1. R. venosus Pursh -- Wild Begonia, Sour Greens -- Showy sand species with a panicle of large, coloured fruits. Stoloniferous and decumbent, the stem 1-3 dm long. Leaves entire, slightly fleshy, broadly lanceolate. Fruit yellow or pink to deep red. Valves reniform, entire, 1-3 cm wide. Late spring, shedding its fruits before mid summer. Sandy and semi-open soils. -- sMan-Alta, US.

2. R. salicifolius Weinm. var. angustifolius Meisner (R. mexicanus Meisner var. angustifolius (Meisner) Boivin, var. triangulivalvis (Danser) Lep.: R. pallidus Big.; R. triangulivalvis Rech. f.; R. utahensis Rech. f.) -- Most obviously different in the field by its habit: all the stem-leaves subtending branches or axillary tufts. Stems 3-10 dm high, tufted, \pm ascending. Leaves 1-(2) dm wide, linear-lanceolate, entire, thickish. Panicle open. Valves 3-4 mm long, 2.5-3.0 wide, triangular to triangular-deltoid, somewhat dentate in the lower half. Grains 3, rarely only 1, exceptionally none, about 2 mm long, up to 1 mm wide. First half of summer. Wet places and sloughs, sometimes weedy. -- sMack, NF-SPM, NS-BC, US.

Very variable, much divided and subjected to many name changes. It is not easy to arrive at a satisfactory classification of its more significant types. Many phenotypes have received varietal or specific names, but most such entities are local or sporadic variants of no particular interest and we have relegated them to synonymy. In our present understanding of the series, only one geographical variation occurs in our area. But three other varieties are to be found east, west and south of us, respectively as follows.

Around Hudson Bay, a var. subarcticus (Lep.) stat. n., R. subarcticus Lep., Nat. Can. 82: 191. 1955 with smaller leaves, less than 1 dm long, purplish inflorescence, moniliform racemes and tardily developing grains.

To the west of us the typical var. salicifolius, including R. sibiricus Hultén, with the grains relatively larger, about $\frac{2}{3}$ as long and at least half as large as the valves.

Further to the south, var. mexicanus (Meisner) C.L. Hitchc, with larger fruits, the valves 4-5 mm long, 3.5-4.0 mm wide.

2 X. R. Franktonis Boivin -- Hybrid of R. fennicus with R. salicifolius var. angustifolius. The stem tall, coarse and erect as in R. fennicus, but branchy and with numerous fascicles as in mexicanus. Leaves crisp, but often narrow. Valves triangular-ovate, entire or nearly so, subcordate at base. Grains small or insignificant, about 1 mm long, mostly 1-2 per fruit. Sterile or nearly so, but producing a fertile amphiploid. Local: Kindersly -- S.

3. R. FENNICUS Murb. -- (Patience, Doche) -- A tall virgate herb, its large and compact inflorescence much in evidence around sloughs towards the end of the summer. Stem 8-15 dm high, coarse, with a solid core, simple. Axillary fascicles poorly developed. Leaves few, large, strongly crip-margined, long cuneate at base. Valves entire or merely wavy-margined, (3)-4-(5) mm wide, short cordate, the base deeply cordate. Around mid summer or rarely earlier. Low places -- Y, Q-BC, US, Eur.

Perennial, but apparently able to flower the first year, hence probably its success as a weed. Spreading rapidly and still very local at the limits of its range: Dawson in Yukon, Thetford Mines in Quebec, Calgary and Writing on Stone in Alberta, Davie Lake in B.C.

4. *R. LONGIFOLIUS* DC. (*R. domesticus* Hartm.) -- (Patience, Doche) -- Much like fennicus in habit and other characters, but the valves larger, mostly 6-(8) mm wide, tending to be somewhat larger than long and rather reniform in outline. Stem often somewhat fistulose. Stem leaves commonly broader at base, usually broadly cuneate to cordate. Grains lacking or minute, may be 1/10 the width of the valve. Early summer. Recent and still rare weed of wet places: Austin, Virden, Yorkton. -- G, sAKa, NF-(SPM), NS-ecS, seBC, (US, Eur).

A report from Otterburne was based on a collection since revised by Dr. C. Frankton to *R. crispus*.

5. *R. occidentalis* Watson var. occidentalis (var. fenestratus AA.; *R. fenestratus* AA.) -- Habitally similar to *R. fennicus* etc., but the pedicel devoid of an articulation. Stem fistulose. Leaves cordate at base. Valves deltoid-ovate, entire to subdentate, quite grainless. Early summer. Sloughs and wet places. -- K-Y, Q-BC, US.

In our variety the valves are 4-6 mm long and the seeds 3-4 mm. In more maritime regions there occurs a large fruited and disjunct var. labradoricus Rech. f. (including var. procerus (Greene) J.T. Howell), its valves 6-8-(11) mm long, its seeds 4-5 mm long.

6. *R. CONFERTUS* W. (*R. Patientia* AA.) -- Leaves broadest, triangular-cordate, the blade shorter than the petiole. Basal leaves commonly 2 dm wide, the stem leaves similar but somewhat smaller and the upper longer than their petiole. Valves \pm 8mm wide, dentate, reniform, broader than long. Grains small or lacking, usually less than 1 mm wide. Early summer. Rare roadside weed: Ethelbert. -- Man, Eur.

Reports of *Rumex Patientia* L. in Canadian botany are generally to be discounted, especially the older ones. While it has been frequently reported from Nova Scotia to British Columbia, its actual Canadian range is apparently restricted to a few Ontario localities. We have verified specimens from Ottawa, Kingston, Salmon Pt., Woodstock and Napanee. All other Canadian collections checked turned out to belong to some other species, and all other unchecked reports are held as questionable pending checking of their vouchers.

7. *R. orbiculatus* Gray (*R. britannica* AA.) -- Yellow Dock, Pale Dock -- Also habitally similar to *R. fennicus*, but the valves grain-bearing and the pedicels without articulation. Stem fistulose, its leaves long cuneate at base, weakly dentate below the middle. Grains 2-3 mm long, borne on a stipe-like base \pm 0.5 mm long. Mid summer. Wet meadows and marshes in fresh water areas. -- (NF-SPM), NS-Alta, US.

A range extension by Henry 1915 to the lower Fraser in B.C. has never been confirmed and was ignored by Taylor 1966; it should be discounted as unsubstantiated. This and many other similar reports of various species by Henry may not be verifiable as his herbarium was reputedly destroyed by the executor of the estate.

8. *R. CRISPUS* L. -- Curled Dock, Sour Dock (*Patience sauvage*, *Reguette*) -- Again habitally similar to *R. fennicus*, but the valves with 3 grains of very unequal size. Stem nearly solid. At least the upper leaves truncate to cordate at base. Valves broadly cordate. Larger grain about $1/3$ as wide as the valve, not at all stipitate. Second grain much smaller and the last minute. Just before mid summer. Ditches; tolerant of saline soils. -- (Y-Aka, L)-NF-(SPM), NS-Q-(O)Man-S-(Alta-BC, US, Eur).

9. *R. STENOPHYLLUS* Led. (*R. obtusifolius* AA.) -- Again habitally similar to *R. fennicus*, but the valves sharply dentate. Glabrous. Stem leaves broadly to narrowly cuneate at base. Inflorescence more open, partly moniliform. Valves deltoid, coarsely and sharply dentate, the teeth less than 1 mm long. Grains large, but one of them usually smaller than the other 2. All summer. Wet places, mostly ditches. -- sQ-sWAlta, US, Eur.

The only report of *R. obtusifolius* L. from our area was based on Dore & Breitung 12552, Weyburn, 1950 (DAO, SASK). In 1964 this was revised by Dr. C. Frankton to *R. stenophyllum*. We concur.

10. *R. DENTATUS* L. -- Valves acicular-lobed like the following, but the branches glabrous and the pedicel with an articulation. Only 3-4 dm high and very branchy. Pedicels thick, shorter than the fruits. Grains 3, large. (Mid summer?) Rare weed of cultivated land: Lethbridge. -- swO, swAlta, Eur, (Afr).

Subdivided in 7 subspecies in the latest regional monograph. The paucity of specimens at hand allows neither an evaluation of these taxa nor a more accurate determination of our only collection.

11. *R. maritimus* L. (var. *fueginus* (Phil.) Dusén; *R. persicarioides* L.) -- Golden Dock -- Valves with 5-(7) acicular lobes. Branchy, 2-6 dm high. Short pubescent on the stem, branches and midnerves. Leaves \pm crisp-margined. Pedicels thin. Valves with lobes \pm 2 mm long, longer than the width of the undivided part of the blade. Summer. Common on shores and wet places, fresh or saline. -- (sMack)-Y-(Aka), NS-BC, US, (SA), Eur.

11 X -- *R. Alexidis* Boivin -- Hybrid of *R. stenophyllum*. Puberulent in the inflorescence and branchy in the manner of *R. maritimus*. Coarser, broader-leaved and with larger fruits, as *R. stenophyllum*. Valves 3-4 mm long, \pm 2 mm wide, the acicular teeth less than 2 mm long and very uneven in length. Local: Regina. -- S.

12. *R. ACETOSELLA* L. -- Sorrel, Redweed (*Petite Oseille*, *Surette*) -- Valves only marginally wider than the achene. Stoloniferous, dioecious, 1-4 dm high. Most leaves conspicuously hastate, otherwise entire. Outer sepals small, less than 1 mm long, but the valves up to 1.5 mm long. Summer. Occasional weed of acid soils -- G, Y-Aka, L-SPM, NS-BC, US, (CA, SA), Eur, (Afr, Oc).

13. *R. Acetosa* L. (*R. alpestris* (Scop.) Löve) -- Sweet-leaf, Sally Chives (*Oseille*, *Grande Oseille*) -- Outer sepals

tightly reflexed in fruit. Dioecious perennial, less than 1 m high. Stem leaves sagittate to \pm hastate at base. Sepals about 1 mm long in flower, enlarging to 2 mm in fruit, those of the male plants about 2 mm long. Valves entire, orbicular-reniform, with a minute and inconspicuous grain. Early summer. Sometimes cultivated and rarely escaping to roadsides; native to the alpine prairies of the Rockies. -- G, Mack)-Y-Aka, NF-SPM, NS-(PEI)-NB-BC, US, (SA), Eur, (Afr, Oc).

Native plants tend to larger basal leaves, those often cordate at base rather than sagittate or hastate. These tendencies are not sufficiently constant to enable us to implement a taxonomic distinction that would not rely heavily on the habitat or locus of collecting.

14. R. paucifolius Nutt. (R. pauciflorus sphalm.) -- Resembling R. Acetosa, but the leaves oblanceolate and long cuneate at base. Sepals of the male flowers 1.5-2.0 mm long, those of the female ones less than 1 mm long, spreading on the fruit. Valves cordate, grainless. Mid summer. High alpine; reported for the Rockies. -- (swAlta)-seBC, wUS.

4. OXYRIA Hill

Basic floral number is 2 while the rest of the family favors 3. Valves not winged and only slightly larger than the 2 outer sepals. Fruit winged.

1. O. digyna (L.) Hill -- Rhubarb, Mountain Sorrel -- Herb with reniform basal leaves. Stem leaf none or only one small one. The whole plant often bright red, especially the fruit wings. Sepals and valves oblanceolate to spatulate. Wings forming a near circular ring around the achene. Early to mid summer. Alpine and subalpine gravel slopes. -- G-Aka, L-NF, NS-Q, swAlta-BC, US, Eur.

5. RHEUM L.

Fruit 3-winged, subtended by 6 small sepals.

1. R. RHAPONTICUM L. -- Rhubarb, Pie-Plant (Rhubarbe) -- Huge, ovate rosette leaves with a succulent petiole. Forming large tufts. Inflorescence rather tall, whitish in flower. Fruits brownish. Early summer. Often cultivated and persisting indefinitely around abandoned homesteads. -- NB-S, BC, (US, Eur).

6. POLYGONUM L.

KNOTWEED

Basic type of the family. Fruit not winged, but surrounded by the persistent calyx of \pm 5 tepals.

a. Stem with a ring of long, reflexed hairs at the nodes; usually climbing 20. P. cilinode
aa. Nodes not specially pubescent.

b. Climbing by twining stems.

c. Fruit wingless 21. P. Convolvulus

- cc. With 3 broad wings 22. P. scandens
- bb. Not climbing.
 - d. Flowers in panicles or corymbs.
 - e. Flowers in axillary panicles...23. P. cuspidatum
 - ee. Flowers in elongating corymbs at the end of the stem and branches.
 - f. Seed smooth 24. P. Fagopyrum
 - ff. Seed verrucose 25. P. tataricum
- dd. Flowers in axillary glomerules or in terminal racemes.
 - g. Flowers solitary or in axillary glomerules Group A
 - gg. Flowers all or mostly in leafless terminal racemes Group B

Group A

Flowers solitary or in numerous small axillary glomerules. Or the inflorescence sometimes becoming spiciform towards the end of the branches, but then at least the lower clusters conspicuously bracted. Ocrea deeply lacerate into mostly 2-3 lanceolate to linear lobes.

- a. Fruit reflexed or pendant on a recurved pedicel.
 - b. Calyx 3-4 mm long8. P. Douglasii
- bb. Calyx 2.0-2.5 mm long; plants smaller.
 - c. Leaves narrowly lanceolate to linear 6. P. Engelmannii
- cc. Broader, the main ones oblanceolate to obovate 7. P. Austiniae
- aa. Fruit ascending or erect.
 - d. Glomerules crowded towards the end of the branches into dense and leafy spiciform inflorescences.
 - e. Leaves ovate to elliptic 5. P. minimum
 - ee. Narrower, lanceolate to narrowly linear.
 - f. Achene chestnut-brown 9. P. Kelloggii
 - ff. Achene jet-black10. P. confertiflorum
- dd. Glomerules distant to scattered; some of the glomerules may be gathered in poorly defined and leafy, spiciform, terminal inflorescences.
 - g. Calyx lobes about as long as the tube; leaves broad 3. P. achoreum
 - gg. Lobes twice as long as the tube.
 - h. Leaves rather large, the main ones 1.0-2.5 cm wide, and very finely pencilled in white at the margin..2. P. erectum
 - hh. Narrower and the margin green.
 - i. Stiffly erect; flowers greenish 4. P. ramosissimum

- ii. Normally depressed to decumbent; tepals with a broad white to red margin 4. P. aviculare

Group B

Flowers in well defined and leafless terminal racemes. Axillary glomerules also present in some species. Ocrea not lacerate, but more or less truncate at mouth.

- a. Leaves 1-3-(4); stem simple and bearing a single terminal raceme.
 - b. Flowers replaced by bulblets in the lower part of the raceme 17. P. viviparum
 - bb. Lacking bulblets 18. P. bistortoides
- aa. At least the leaves more numerous.
 - c. Leaves broadly cordate 20. P. cilinode
 - cc. Leaves broadly to narrowly lanceolate.
 - d. Perennial with the erect branches usually simple and bearing only 1-(2) racemes 11. P. amphibium
 - dd. Annual and branchy, with many racemes.
 - e. Leaves deeply cordate at base ..
..... 19. P. sagittatum
 - ee. Cuneate at base.
 - f. Perianth abundantly glandular-punctate; racemes lax.
 - g. Most stem-nodes with the ocrea distended or ruptured by a glomerule of enclosed cleistogamous flowers 16. P. hydropiper
 - gg. No axillary glomerules ..
..... 15. P. punctatum
 - ff. Not punctate but glabrous or beset only with sessile glands; racemes dense.
 - h. Main ocreae long ciliate; achene lenticular.... 12. P. persicaria
 - hh. Not ciliate; achene discoid.
 - i. Achenes small; overtopped by the calyx lobes ..
..... 13. P. lapathifolium
 - ii. Larger, at least the beak of the style protruding ..
..... 14. P. scabrum

1. P. ramossissimum Mx. (P. exsertum Small; P. interior Brenckle) -- Stiffly erect annual, resembling P. Douglasii, but the fruits \pm erect. Stem (3)-5-7-(10) dm high and quite branchy. Leaves lanceolate to linear, the main ones much larger, becoming much reduced towards the end of branches. Glomerules tending to form moniliform inflorescences towards the tip of the branches. Calyx green with paler margins. Outer sepals

obviously longer than the inner. Achene purple-brown. Mid summer. Shores and wet meadows. -- (Y-Aka), NS-O-(Man)-S-Alta-(BC, US).

2. *P. erectum* L. -- Erect or decumbent and rather coarse, resembling the last, but the leaves broad, even broader than the next. 5 dm high or more and the fairly abundant foliage rather light green. Leaves elliptic to elliptic-lanceolate, very finely crenulate and very finely pencilled in white at the margin. Calyx deeply lobed and mostly yellowish white at margin. Mid to late summer. Shores and other exundated places. -- Aka, NF, PEI-Man-(S-BC), US.

3. *P. ACHOREUM* Blake -- Calyx not so deeply divided, the tube about as long as the lobes and reaching slightly beyond the broadest part of the achene. Resembling the following, but coarser, not so depressed and rather decumbent with ascending tips. Leaves rather broad, obovate to oblong, about twice as long as broad, the main ones commonly around 1 cm wide. Flowers greenish. Summer and fall. Around buildings and along roadsides, at least since 1880. -- Mack-Aka, NB-BC, US.

Paler green and broader-leaved than *P. aviculare*, it tends to branch, when not tramped too much, into a globose mass reminiscent of the Rolling Mustards. We do not know if it actually behaves like a Rolling Mustard in late fall. It is especially in evidence at the edge of newly graded highways where it is often the most conspicuous and abundant pioneer. We find this entity to be quite readily distinguished from *P. aviculare* and we must admit of some puzzlement over the frequency of misidentifications, some by leading taxonomists. In one such case Fernald, *Rhodora* 52: 18, 1950, reported *P. achoreum* occurring as a native on the shores of the Bay of Fundy. This being the only report of the species for the province, the justifying sheet was borrowed for study and it turned out to be a specimen of *P. aviculare sensu lato*, one of those seacoast specimens one might have expected Fernald to identify as *P. Fowleri* or *P. boreale*.

4. *P. AVICULARE* L. (var. *angustissimum* Meisner, var. *littorale* (Link) W.D.J. Koch; *P. boreale* (Lange) Small; *P. buxifor-me* Small; *P. caespitosum* A. & G.; *P. Fowleri* Rob.; *P. heterophyllum* Lindman; *P. neglectum* Besser; *P. ovalifolium* Lehm.; *P. prolificum* (Small) Rob., var. *autumnale* Brenckle) -- Knotweed, Doorweed (*Trainasse*, *Herbe à cochons*) -- A common and exceedingly variable species, often subdivided into a series of microspecies. Creeping to suberect annual. Leaves broadly to narrowly oblanceolate, usually less than 1 cm wide. Calyx lobes with a broad white to pink or red margin. Achene greenish brown to chestnut brown. Early summer to frost. Open to semi-open ground, especially in barnyards and tramped places. -- (G), seK-Aka, L-SPM, NS-BC, US, Eur, (Oc).

Highly variable, highly plastic and responding most readily to ecological conditions; especially tolerant of tramping, even of excessive tramping. Treatments of this species vary greatly from author to author and some will recognize up to 20 segregates. We find that the 3 segregates that precede are reasonably

distinct, but we are not convinced that further splitting is justified within the Canadian material. We are especially dubious of characters of size of achenes as these obviously vary greatly in any area, with late season specimens tending to produce longer achenes, and the odd specimen bearing some unusually large achenes. As pointed out by one author, accurate determinations of heterophylly can be made only in young well grown plants. This means that with most herbarium specimens one has to start by guessing either at the heterophylly or at the fruit size if an attempt is to be made at recognizing segregates of *P. aviculare*. The most commonly recognized segregate is *P. Fowleri*, a seashore type said to range along the northern seacoasts from Maine, to Washington State. We have studied an extensive series of specimens so determined or verified by various specialists of the group and we have been unable to detect any consistent difference, other than the seashore habitat, between these plants and the rest of *P. aviculare*.

5. *P. minimum* Watson -- Small annual species with rather large leaves. Up to 1.5 dm high, often branched from the base. Main stem nodes elongate, but most leaves and flowers crowded at the tip of the branches. Leaves less than 1 cm long, ovate to oblong. Summer. Dry hillsides and rocky outcrops in the Rockies. -- swAlta-BC, wUS.

6. *P. Engelmannii* Greene -- Similar to *P. Douglasii*, but smaller. Less than 2 dm high and usually very branchy from the base. Leaves narrow and tepals small. Summer. Disturbed soils; rare: Waterton, Pincher Creek, Livingstone Gap. -- swAlta-(seBC), wUS.

7. *P. Austiniae* Greene -- Resembling the preceding, but the leaves broader, the main ones oblanceolate to obovate or spatulate. Around 1 dm high. Tepals with a broad white margin. Summer. Disturbed soils in the mountains. -- swAlta-sBC, wUS.

8. *P. Douglasii* Greene var. *Douglasii* -- Fruits reflexed to pendant. Stiffly erect annual (1)-3-(7) dm high. Leaves lanceolate to narrowly linear. Flower mostly solitary, mostly borne in the axil of reduced upper leaves and tending to form very lax spiciform inflorescences. Summer. Dry hillsides and rocky outcrops. -- swQ-BC, US -- Var. *latifolium* (Eng.) Greene -- Main leaves broader, commonly oblong-lanceolate to lanceolate, mostly about 1 cm wide. Tending to replace the typical phase in the mountains: Cypress Hills and Rockies. -- swS-swAlta-sBC, (wUS).

9. *P. Kelloggii* Greene (*P. Watsonii* Small) -- Achene chestnut brown. Small erect annual less than 1 dm high. Glomerules mostly aggregated towards the tip of the branches into very leafy inflorescences. Upper bracts sometimes narrowly white-margined in the manner of the following species. First half of summer. Exsiccated places: Cypress Hills, Redcliff. -- swAlta-(swBC), wUS.

The Cypress Hills collection was by Macoun in 1880 (QK; DAO, photo). No further precision was available on the place of origin of this specimen and no modern collection has been

made that could provide further information.

10. P. confertiflorum Nutt. -- Much like the preceeding, but most of the inflorescence bracts with a conspicuous white margin. Achenes jet black. Early summer. Exsicated places. Rare or overlooked: Bélanger. -- swS-(Alta-BC, US).

11. P. amphibium L. var. amphibium (var. Hartwrightii (Gray) Bissell, var. stipulaceum (Coleman) Fern., f. fluitans (Eaton) Fern., f. hirtuosum (Farw.) Fern.; P. natans Eaton, f. Hartwrightii (Gray) Stanford; Persicaria fluitans (Eaton) Greene; Persicaria nebraskensis Greene; Persicaria psychrophila Greene) -- Lakeweed, Red Shanks -- Stoloniferous perennial, submerged to terrestrial. A rather coarse herb, hirsute to glabrous. Leaves oblong-lanceolate to linear-lanceolate, broadest near the middle. Spike 1-5 cm long, pinkish red, terminal and normally solitary. Mid summer. Muddy shores and shallow waters. -- Mack-Y-(Aka, L-NF)-SPM, NS-BC, US, Eur -- Var. emersum Mx. (P. coccineum Muhl., f. natans (Wieg.) Stanford, f. terrestre (W.) Stanford, var. pratincta (Greene) Stanford, var. rigidulum (Sheldon) Stanford; P. Muhlenbergii Watson; Persicaria coccinea (Muhl.) Greene; Persicaria mesochora Greene; Persicaria Muhlenbergii (Watson) Small; Persicaria pratincta Greene; Persicaria rigidula (Sheldon) Greene) -- Leaves narrowly ovate-lanceolate, broadest near the base, more acuminate. Spike usually longer, up to 4-10 cm long and elongate-cylindric. -- Mack, NS-BC, US.

Most current floras will subdivide our plant in two species and even further into a more or less elaborate series of varieties and forms. The specific distinction is based on the leaves being more acuminate, the peduncles pubescent and the spike longer. On the basis of the material at hand, the peduncle pubescence is not linked to the leaf form or spike length, but to the water level; it appears to be an ecological character. The spike length is not a discontinuous character, it is only an extreme of variation and is readily detectable only in late season. Similarly the leaf shape is only an extreme of variation and is to be recognized readily only on vigorous and emersed plants. Both extremes are weakly linked and neither occurs in the eurasian specimens examined; they appear to characterize a weak geographical variation. Other characters studied did not appear to be in any way significant.

In a normally amphibious species, floating and emersed forms are part of the normal variation and are not deemed worthy of taxonomic designation.

12. P. PERSICARIA L. -- Heart's Ease, Black Heart (Fer à cheval, Pied rouge) -- Resembling the following but the ocrea with the nerves long excurrent in the form of long and stiff cilia. Leaves often with arrowhead-shaped purple blotch above, not punctate below, but glabrous to lightly scabrous. Ocrea pubescent with flexuous and partly adnate hairs. Inflorescence glabrous or sometimes somewhat glandular. Racemes usually pink. Achene 2 mm wide or less, slightly concave on one side, convex on the other, usually overtopped by the calyx lobes. Summer and

early fall. Infrequent weed of disturbed soils. -- (G, Y)-Aka, L-NF-(SPM), NS-BC, US, Eur.

13. P. lapathifolium L. (var. salicifolium Sibth.; P. Persicaria L. var. lapathifolium (L.) Meisner; Persicaria incar-nata (Ell.) Small; Persicaria lapathifolia (L.) S.F. Gray) -- Leaves glandular-punctate in yellow underneath. Annual, usually erect, with \pm lanceolate leaves. Ocrea eciliate and glabrous, or the lowermost and uppermost very short-ciliate. Leaves glabrous below. Racemes normally pink. Inflorescence glabrous or sometimes glandular. Achene small, 1.5-2.0 mm wide, overtopped by the calyx lobes, more flattened than in the preceeding, discoid and concave on both sides. Mid summer. Wet places, mostly exsiccated. -- (G, Mack), Aka, (NF-SPM), NS-Alta-(BC), US, Eur.

The Scoggan 1957 report of P. pensylvanicum L. from our area was based on a sheet, E. Scamman 2878, Clear Lake, 1941 (GH), which we have since revised to P. lapathifolium. A report by Löve 1959 of Persicaria pensylvanica (L.) Gomez f. albinea (Farw.) Löve & Bern. was also based on a sheet (MSM; DAO, photo) similarly revised since to P. lapathifolium.

14. P. SCABRUM Moench (P. tomentosum Schrank; Persicaria incana (F.W. Schmidt) S.F. Gray; Persicaria tomentosa (Schrank) Rickn.) -- Much as in the preceeding but the racemes usually pale green. Leaves punctate and glabrous to lightly tomentose below. Inflorescence very glandular. Achene \pm 2.5 mm wide, discoid and concave on both faces, usually somewhat protruding between the tips of the calyx lobes. Summer. Common weed of crops and disturbed soils. -- (Mack), Aka, (L)-NF, NS-(PEI-NB)-Q-BC, (US, Eur).

15. P. punctatum Ell. var. confertiflorum (Meisner) Fasset (var. leptostachyon AA.) -- Racemes lax and somewhat drooping at tip. Otherwise with the general habit of P. Persicaria and the ocrea similarly long-ciliate. Axillary glomerules lacking. Ocrea strigose with stiff and half adnate hairs. Raceme irregularly moniliform. Perianth green with white margins. Second half of summer. Wet places and shores. -- NS-ecS, sBC, US, (CA).

Our variety is annual while the typical variety is perennial and its leaves are often larger.

Our plant has also been called var. leptostachyum (Meisner) Small, but this is an illegitimate name and further it is based on a javanese variant, not on our cisatlantic phase.

16. P. Hydropiper L. (var. projectum Stanford) -- Smartweed, Water-Pepper (Gurage, Poivre d'eau) -- Both terminal racemes and axillary glomerules present. Otherwise much as in the preceeding. Axillary glomerule more or less included in the ocrea. Perianth white-margined or more commonly pinkish. Late summer. Shores: Red River. -- (Aka, NF-SPM), NS-(PEI-NB)-Q-Man, BC, US, Eur, (Afr, Oc).

17. P. viviparum L. var. viviparum -- Bistort, Serpent-Grass (Petite bistorte) -- Raceme with a large proportion of the flowers replaced by fleshy bulblets, the remaining flowers sterile. Tufted perennial. Stem 1-3 dm high, stiffly erect,

simple, mostly with only 1 leaf. Leaves lanceolate to linear, usually pilose below. Inflorescence linear, whitish, less than 1 cm wide. Early to mid summer. Wetter spots in arctic and alpine prairies. -- G-Aka, L-SPM, Q-nMan-nS-BC, US, Eur.

A Saskatchewan report for lake Athabaska by Breitung 1957 is credited to Raup 1936. But the latter cites only Alberta and Mackenzie collections. Our Saskatchewan report is based on a Lake Hansen collection (DAO).

Along southern Alaska occurs a var. Macounii (Small) Hultén, coarser and with a smaller calyx.

18. P. bistortoides Pursh -- Similar to P. viviparum, but not bulbiferous. About twice taller with mostly 3 stem leaves. Raceme oblong, 1.5-2.5 cm wide. Early summer. Montane prairies: Cypress Hills and Rockies. -- sAlta-(eBC), WUS.

19. P. sagittatum L. -- Arrow-Vine, Tear-Thumb (Grathecule) -- Stem and branches very rough and very catchy because of lines of very small and recurved prickles. Climbing on surrounding vegetation. Leaves sagittate-lanceolate, prickly along the mid nerve. Flowers in terminal capitate racemes. Second half of summer. Wet open places. -- NF-SPM, NS-Man, US, (Eur).

20. P. cilinode Mx. (Bilderdykia cilinodes (Mx.) Greene) -- Bindweed -- An erect native perennial with deltoid-hastate leaves. Stem reflexed-puberulent, not infrequently twining at tip. Leaves hastate at base, acuminate at tip. Inflorescence a panicle of lax racemes. Early summer. Open sands and granite outcrops. -- (NF), NS-cS, US.

Macoun 1886 reports it from the Lesser Slave Lake, but in 1964 we leafed through subgenus Tiniaria at CAN without finding a justifying specimen. To our knowledge this species does not extend west of Lac La Ronge.

21. P. CONVULVULUS L. (Bilderdykia Convolvulus (L.) Dum.) -- Bindweed, Black Bindweed (Chevrier, Vrillée sauvage) -- Annual weed with twining stems. Leaves deltoid-hastate. Stem minutely scabrous in lines. Flowers either in axillary clusters or mostly in interrupted racemes borne on long axillary pedicels. Summer. Frequent weed of cultivated fields and waste places. -- G, Mack-Aka, L-SPM, NS-BC, US, Eur, (Afr, Oc).

22. P. scandens L. var. scandens (var. dumetorum AA.) -- False Buckwheat, Wild Buckwheat (Vrillée bâtarde) -- Similar to the previous two but the fruit much larger and with 3 conspicuous wings. Perennial with twining stems, the latter glabrous and smooth or nearly so. Leaves similar to the previous two. Flowers in interrupted and bracteolate axillary racemes. Fruit 9-15 mm long, measured from the articulation, the body only 6-10 mm long, with wings arising from the midnerve of the 3 outer tepals. Second half of summer. Shores. A rare native in southern Manitoba, or perhaps only a weed with us. -- (NF), NS-sMan-swS-cAlta-(seBC), US.

In var. dumetorum (L.) Gleason the fruit is somewhat smaller, not exceeding 10 mm if measured from the articulation, the body \pm 5 mm long. Reputedly, this paleogean var. dumetorum is naturalized at a number of places in North America, but all

New World specimens examined have been revised to var. scandens.

23. P. CUSPIDATUM Sieb. & Zucc. -- Japanese Knotweed, Horse-Buckwheat (Jérusalem) -- Tall coarse herb with large nearly round leaves, truncate at base, abruptly short-acuminate. Up to 3 m high. Leaves about 1 dm long. Flowers in axillary panicles. Fruit similar to P. scandens. End of summer. Sometimes cultivated and often persisting indefinitely, more rarely spreading to adjacent fields: Winnipeg. -- (Aka), NF, NS-Man, swBC, neUS, eEur.

There is an earlier P. cuspidatum W., but the latter is only a nomen nudum and its existence does not proscribe the present usage. See Merrill in Rhodora 40: 290-1, 1938.

24. P. FAGOPYRUM L. (Fagopyrum esculentum Moench; F. sagittatum Gilib.) -- Buckwheat (Sarrazin, Blé noir) -- Leaves deltoid, cordate at base, somewhat acuminate at tip. Annual. Flowers commonly white, in ± corymbose clusters that will often elongate in fruit to become somewhat racemose and irregularly interrupted. Tepals about half as long as the achene. Summer. Crop plant which sometimes reappears a second year or as an impurity in cultivated fields. -- NF, (NS)-PEI-Q-(Man)-S, US, Eur.

25. P. TATARICUM L. (Fagopyrum tataricum (L.) Gaertner) -- Buckwheat, Tartary-Buckwheat (Sarrazin de Tartarie, Fagré) -- Seeds coarsely and irregularly undulate-verrucose, especially on the angles. Flowers somewhat smaller and usually greenish, the tepals 1.5-2.0 mm long. Otherwise much as in the preceding. Summer. Rare impurity in crops or a roadside weed. -- (NF, NS), NB-Q-(Man)-S-Alta, (US), Eur.

77. ILLECEBRACEAE (ILLECEBRUM FAMILY)

Reduced type from the Caryophyllaceae, the fruit being reduced to a 1-seeded utricle. Leaves opposite, etc., but the petals lacking as in the Polygonaceae.

- a. Stipules conspicuous 1. Paronychia
aa. Lacking 2. Scleranthus

1. PARONYCHIA Miller

WITLOW-WORT

Herbs with conspicuous stipules and generally resembling the Caryophyllaceae. Petals lacking.

1. P. sessiliflora Nutt. (P. depressa AA.) -- Cushion-forming species with membranous stipules mostly longer than the leaves. Puberulent. Leaves stiff, with spinescent tips. Sepals cucullate above and ending in a deflexed spinescent tip. Not particularly conspicuous at flowering. First half of summer. Dry hills. -- sS-sAlta, US.

Not to be confused with Phlox Hoodii of similar habit. The latter lacks the numerous, large and transparent stipules.

THE VERVAINS COLLECTED ON THE GALAPAGOS ISLANDS BY CHARLES DARWIN
DURING THE VOYAGE OF THE "BEAGLE"

Harold N. Moldenke

During the course of studies of the Avicenniaceae and Verbenaceae of the Galapagos Islands for Dr. Ira L. Wiggins' projected Flora of these fascinating islands, it soon became apparent that the original collections made by Charles Darwin early in October of 1835 on those islands would have to be re-examined.

Hooker in 1847 [Trans. Linn. Soc. Lond. Bot. 20: 195] identified one of Darwin's collections as "Verbena polystachya H.B.K. var. foliis incisis segmentis grossè serratis", although on the actual specimen's label he wrote merely "Verbena polystachya H.B.K. var. ?"

Andersson in 1854 [Vet. Akad. Handl. Stockh. 1853: 199—200] and in 1859 [Galap. Veg. 81] reduced Hooker's proposed variety to synonymy under what he called "Verbena caroliniana Linn.", to which he also reduced V. polystachya H.B.K.

Robinson in 1902 [Proc. Am. Acad. 38: 196] concurred in this reduction, but used Linnaeus' original spelling of V. carolina L. Robinson also gave V. polystachya H.B.K. and "V. caroliniana Anderss." as synonyms of V. carolina. In 1911 Stewart [Proc. Calif. Acad. Sci., ser. 4, 1: 134] also accepted the name V. carolina L. in his work on the flora of the Galapagos Islands.

All these workers cite only an unnumbered Darwin collection from James Island as the basis of the record and there is no evidence that any one of them after Hooker actually examined the original specimen, although an unknown hand did at some time change Hooker's original determination as written on the sheet to "V. urticifolia L. ?" and then to "V. carolina L."

Actually, Verbena carolina is a species known abundantly from southern Arizona and throughout Mexico, extending southward through Guatemala into Honduras and El Salvador. It was not known from anywhere south of these Central American countries except for this Darwin record from the Galapagos.

Similarly, Verbena urticifolia is a very common species in southeastern Canada and the eastern portion of the United States, extending westward into the Dakotas, Nebraska, Kansas, and Texas, but unknown from south of our continental border, although it is known to have been cultivated from time to time in gardens in various European countries.

Through the courtesy and kindness of the botany staff at Cambridge University, in England, I have been able to secure the loan of the original Darwin specimen and find, as suspected, that it does not represent either of these suggested northern species. Rather it is obviously an as yet undescribed variety of the endemic V. sedula Moldenke, described by me in 1955 [Phytolo-

gia 5: 229] from Indefatigable Island, based on Bowman 81, which was also originally misidentified and distributed to herbaria as Verbena carolina.

The new taxon is, therefore, officially described herewith:
VERBENA SEDULA var. DARWINII Moldenke, var. nov.

Haec varietas a forma typica speciei caulis perspicue densiusculeque pilosis recedit.

This variety differs from the typical form of the species in having its stems conspicuously and rather densely long-pilose with antrorsely subtrigose or somewhat divergent hairs. The abbreviated branches, petioles, and lower leaf-surfaces are also quite densely and conspicuously long-pilose and the upper leaf-surfaces sparsely so.

The type of the variety was collected by Charles Darwin on James Island, Galapagos Islands, in the beginning of October, 1835, and is a sheet labeled "3685" in pencil in the herbarium of Cambridge University, originally from the Henslow Museum herbarium.

The second collection by Darwin was identified by Hooker as V. officinalis L., and, again, this identification was apparently copied blindly by Andersson, Robinson, and Stewart in the references cited above.

Verbena officinalis is a very common and widespread European plant which is now almost cosmopolitan as a so-called "weed" in most parts of the world where Europeans have penetrated and settled. Such plants as these, which we call "weeds" in a derogatory fashion, are actually plants which have been able to adjust well to man's civilization, and, like the European starling and house sparrow, the common dandelion, sheep sorrel, and chicory, have greatly benefited by man's ever-expanding occupation of this earth's habitable surface, where to many other species of wildlife, both plant and animal, less able or completely unable to adjust, have perished or are today on the brink of extermination.

Such a plant as Verbena officinalis would be expected to spread through the settled parts of the Galapagos, if it had been introduced there accidentally, as it has in man's other settlements elsewhere in similar climates. However, since it was never collected again in the Galapagos Islands after Darwin's visit, the suspicion naturally arose that Hooker's identification was erroneous and that we were dealing here not with an aggressive European introduction, but with a native and perhaps limited endemic species.

Thanks again to the kindness of the Cambridge University staff, I have also been able to re-examine this Darwin specimen and have found it to represent the native Verbena glabrata var. temuiscata Moldenke described by me in 1967 [Phytologia 14: 283] from nearby Albemarle Island on the basis of Stewart 3317 and later collected on the same island by J. T. Howell as his no. 9007. Darwin found it on James Island.

Five other species of vervain are known to us today from the Galapagos Islands, perhaps overlooked by Darwin because of his preoccupation with the study of the endemic finches, turtles, lizards, and other more striking and conspicuous forms of wild life at the time.

Verbena galapagosensis Moldenke is thus far known only from Albemarle Island and is represented by A. Stewart 3318 (type) and 3319.

Verbena grisea Robinson & Greenm. is known only from Duncan Island and is represented by G. Baur 180 (type) and by A. Stewart 3315 and 3316.

Verbena stewartii Moldenke is known only from Albemarle Island and is represented only by the type collection, A. Stewart 3320.

Verbena townsendii Svenson is apparently endemic to Indefatigable Island, where it is known only from the type collection, Svenson 249.

These, along with the V. sedula Moldenke referred to previously, are all endemic and apparently quite rare. There is, however, an introduced species which is now quite abundant in many parts of the island group and appears to be spreading in the manner of introduced "weeds". This is Verbena litoralis H.B.K., an extremely common and widespread tropical American species, very variable and polymorphic. It is found naturally from Mexico throughout Central and South America, and is now introduced and often pestiferous in parts of the United States [Arkansas, Louisiana, Texas, Oregon, California], Germany, South Africa, the Hawaiian Islands, Australia, Midway, Gambier, Easter, and the Austral Islands. Darwin is reported to have collected it on Charles Island, but I have not as yet seen this collection. Other collections, however, which I have examined are the following: Albemarle Island: J. T. Howell 8959. Charles Island: N. J. Andersson 117; J. T. Howell 8882; Itow 179; A. Stewart 3321, 3322, and 3323; Wiggins & Porter 423. Chatham Island: N. J. Andersson s.n.; Schimpff 132 and 142; A. Stewart 3324. Indefatigable Island: R. I. Bowman s.n.; R. G. Taylor T.T.125; I. L. Wiggins 18508 and 18558.

CARYA XCOLLINA LAUGHLIN
SCARIT HICKORY

Hibrida nova
Carya texana Buckl. X tomentosa Nutt.

Section Eucarya

Kendall Laughlin (1890-)
165 Pine Ave., Chicago, Ill.

Arbor rotunda 57 cm diametro et 18 m alta, circiter 154 annos nata, cum irregularibus membris insigniter in inferiore languidis. Cortex cinereus, densus, in irregulares ad perpendicularum directas laminas ruptus. Rami unci glauci cum lenticellis, glabri, pingues; inferiores rami languidi. Novi temporis ramuli tomentosi et brunnei, raro glabri et fusci rufo-brunnei cum multis pallidis lenticellis, 3-6 mm densi. Extremae hiemales gemmae 8-19 mm longae, angulatae vel ovoidae, tomentulosae. Pansae gemmarum squamae majoris exempli oblongae, 2.5-3.5 cm longae, subtiliter sericeo-pubescentes in exteriori superficie.

Folia 19-37 cm longa. 8% foliorum habent 5 foliola, 84% habent 7 foliola et 8% habent 9 foliola, quae acuminata sunt, serrata incurvis dentibus, supra glabra et lucida galbina, subtus pallidiora et tomentosa juventate et breviter pubescentia maturitate, specie relinquentia minutas nigras notulas siccando, cum pingui robiginosa tomentosa costa media; extremum foliolum rhomboido-ellipticum, cuneatum, 9.5-17 cm longum, 3.5-7 cm latum, circiter 22 venis lateralibus in utroque latere, sessile aut in petiolulo 4 mm longo; lateralia foliola sessilia, elliptica et saepe leviter falcata, supremis 10-13.5 cm longis, cuneatis, 18-27 venis lateralibus in utroque latere, mediis bifurcis ante attingendum margini; infimis 4-6.1 cm longis.

Petioli et raches 1.1-2 mm densi, dense villosi vel tecti corymbis pallidorum cinereorum pilorum usque ad serum tempus.

(4)-7 stipitati pedunculi in finibus surculorum 3 staminatis galbinis julis 6.5-17 cm longis de quoque pedunculo suspensis.

Fructus 24-30 mm longi, fere globosi, in apice complanati, dehiscente folliculo 3(-4) mm denso 4 valvis, uno segmento majore aliis. Nux pallido-cinerea, 22-24 mm longa, 23-25 mm lata, compressa et languide 4-angulata, eduro denso cortice et semine circiter duas-quintas molis occupante.

Holotypus in Kewensibus Hortis.

CARYA XCOLLINA LAUGHLIN

A round-shaped tree 57 cm in diameter and 18 m tall, about 154 years old, with irregular limbs conspicuously drooping in the lower portion. Bark medium gray, thick, broken into irregular vertical plates. Branches crooked, bluish-gray with lenticels, glabrous, stout; lower branches drooping. Season's branchlets tomentose and brown, rarely glabrous and dark reddish brown with many pale lenticels, 3-6 mm thick. Terminal winter buds 8-19 mm long, angled or ovoid, tomentulose. Expanded bud-scales of the larger type oblong, 2.5-3.5 cm long, finely silky-pubescent on their outer surface.

Leaves 19-37 cm long. 8% of the leaves have 5 leaflets, 84% have 7 leaflets and 8% have 9 leaflets, which are acuminate, serrate with incurved teeth, glabrous and lustrous moderate yellow green above, paler beneath and tomentose when young and short-pubescent at maturity, apparently leaving minute black specks in drying, with a stout rusty tomentose midrib; the terminal leaflet rhomboid-elliptic, cuneate, 9.5-17 cm long, 3.5-7 cm wide, with an average of 22 pairs of side veins, sessile or on a petiolule 4 mm long; the lateral leaflets sessile, elliptic and often slightly falcate, the upper pair 10-13.5 cm long, cuneate, with 18-27 pairs of side veins, the middle ones forking before reaching the margin; the lowest pair 4-6.1 cm long.

Petioles and rachises 1.1-2 mm thick, densely villous or covered with clusters of pale gray hairs until late in the season.

(4-)7 stalked peduncles at the ends of twigs with 3 staminate yellow green catkins 6.5-17 cm long suspended from each peduncle.

Fruit 24-30 mm long, nearly globose, flattened at the apex, with a 4-valved dehiscent husk 3(-4) mm thick, one segment larger than the others. Nut light gray, 22-24 mm long, 23-25 mm wide, compressed and faintly 4-angled, with a very hard thick shell and a seed occupying about two-fifths of its volume.

DISCUSSION

This newly discovered hybrid of the Black Hickory Carya texana Buckl. and the Mockernut Hickory C. tomentosa Nutt., which has a diameter of 23 inches, a circumference of 5 feet 10 inches, a height of 58 feet and a spread of 50 feet, is located at an elevation of about 980 feet on the south slope of Scarritt Point in North Terrace Park, Kansas City, Jackson County, Missouri,

U.S.A.

The surrounding area is mowed, as the accompanying pictures show, and no seedlings are allowed to grow. On the upland a few hundred feet to the west and southwest there are at least four Shagbark Hickories, a Mockernut Hickory, and a curious tree 4'2" in circumference that is undoubtedly a cross between collina and ovata (Mill.) K.Koch. There was once a Black Hickory at the west end of the upland overlooking Cliff Drive and the Chestnut Trafficway canyon, but it was destroyed by a vandal. There are also White, Black and Chinkapin Oaks, Sycamores, American Elms and a Basswood on the ridge.

Texana is at the northern limit of its range at this spot. Tomentosa is sparingly represented north of the Missouri River. It is well known that hybrids occur most often at the limit of the range of one of the parents.

The bark of collina resembles texana. Most branchlets of collina are tomentose and brown like tomentosa, but a few of them are glabrous and dark reddish brown with lenticels like texana. The fruit of collina is like texana. The terminal winter buds of collina are larger than either parent and tomentulose like tomentosa.

The statement on the following page shows a comparison of the characters of collina with its parents. The characters of ovata are also shown, altho there is no chance that collina is related to it. Most of the figures are averages and extreme measurements are not shown.

The last column of the statement shows that the characters of collina are intermediate between the parents in the majority of the cases. Most of the disparities relate to the size of the leaflets and buds. This study and a study that I have made of the ternary hybrid collina X ovata show that an effect of hybridity is to create larger vegetative parts.

The holotype will be deposited in the Royal Botanic Gardens, Kew, England, and an isotype will be deposited in the United States National Museum, Washington, D.C.

MORPHOLOGY OF CARYA

| CHARACTER | TAXON | | | | INSTANCES "X" where
THE CHARACTERS OF
COLLINA ARE INTERME-
DIATE BETWEEN THE
PARENTS |
|--------------------------|------------------------------|---------------------------------------|--|---|--|
| | OVATA | TOMENTOSA | XCOLLINA | TEXANA | |
| Bark | Shaggy. | Dark gray,
ridged and
fissured. | Medium gray,
thick, broken into
irregular
vertical
plates. | Gray, thick,
broken into
irregular
vertical
plates. | * |
| Branchlets: | Reddish
brown. | Greenish
brown. | Brown, rare-
ly dark
reddish
brown. | Reddish
brown with
many pale
lenticels. | * |
| Pubescence | Glabrous
or
pubescent. | Tomentulose | Tomentose,
rarely
glabrous. | Glabrous. | |
| Thickness mm | 3-5.5 | 4 | 4-5 | 3 | |
| Terminal Winter
Buds: | | | | | |
| Pubescence | Tomentose. | Tomentulose. | Tomentulose | Glabrous. | * |
| Shape | Ovoid or
oblong. | Ovoid. | Angled or
ovoid. | Ovoid. | * |

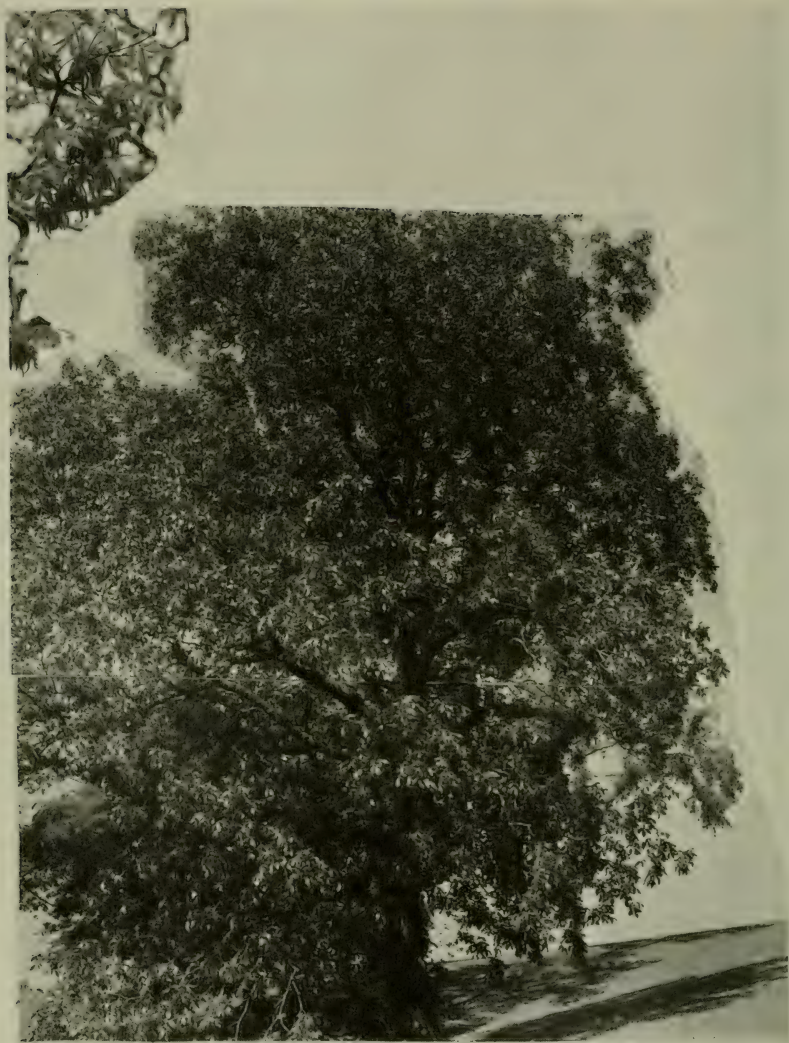
| Length mm | 10-19 | 8-13 | 13-14 | 7 | |
|--|-----------------------------|------------------|-----------------|---------------------|---|
| Length of Leaves
cm | 23 | 28 | 28 | 18 | * |
| % of Leaflets:
5
7
9 | 100% | 15%
77%
8% | 8%
84%
8% | #63%
#34%
#3% | * |
| Pubescence of
Undersurface of
Leaflets | Midrib
villosu-
lous. | Tomentose. | Tomentose. | Glabrous. | * |
| Terminal Leaflet:
Length cm | 14 | 12.5 | 13 | 9 | |
| Length
Width | 2.1 | 2.0 | 2.5 | 2.5 | * |
| Pairs of
Side Veins | 20 | 17 | 22 | 17 | |
| Leaflets of
Upper Pair:
Length cm | 12 | 11 | 12 | 8-9 | |
| Width
Length | .48 | .50 | .32 | .38 | |
| Pairs of
Side Veins | 19 | 16 | 22-23 | 17 | |

| CHARACTER | TAXON | | | | INSTANCES "*" WHERE
THE CHARACTERS OF
COLLINA ARE
INTERMEDIATE BETWEEN
THE PARENTS |
|---|-----------|------------|----------|-----------|--|
| | OVATA | TOMENTOSA | XCOLLINA | TEXANA | |
| Leaflets of
Upper Pair:
Length of
Length of
Lowest Pair | 1.81 | 1.65 | 2.38 | 1.40 | |
| Petioles and
Rachises:
Pubescence | Glabrous. | Tomentose. | Villous. | Glabrous. | * |
| Thickness mm | 1.3 | 2-2.8 | 1.5-1.6 | 1.1 | * |
| Fruit:
Length mm | 38 | 36 | 27-29 | 29-30 | |
| Width mm | 31 | 36 | 29 | 29 | * |
| Nut:
Length mm | 26 | 27 | 23-24 | 23 | * |
| Width mm | 22 | 27 | 24 | 22 | * |
| Thickness of Husk
mm | 8 | 4-5 | 3 | 2-3 | * |

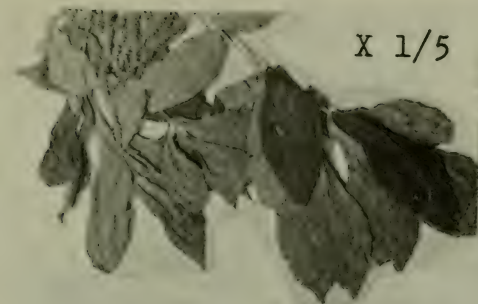
These figures were taken from a study of 35 specimens from Swope Park, Kansas City.
A study of material from five other localities in Missouri, Kansas and Arkansas
combined with the figures from Swope Park results in the following percentages:

5 leaflets--64%
7 leaflets--32%
9 leaflets--4%

The statement in Sargent's Manual and other books that the number of leaflets of
texana is usually 7 appears to be incorrect.



CARYA XCOLLINA

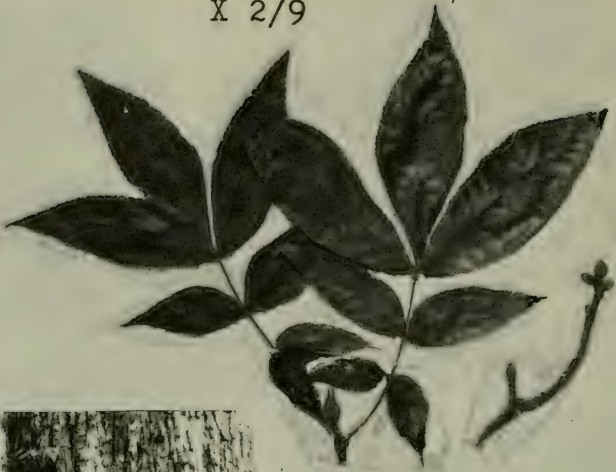


X 1/5



CARYA XCOLLINA IN EARLY SPRING

X 2/9



CARYA XCOLLINA



FRUIT OF CARYA XCOLLINA X 7/9

NOTES ON MALUS LANCIFOLIA REHDER

Kendall Laughlin
165 Pine Ave., Chicago, Ill.

In my monograph on the above species, which was described in Volume II of C. S. Sargent's "Trees and Shrubs" (1907-13), in PHYTOLOGIA 9:108.1963 I portrayed its characters and I condemned M. L. Fernald's misguided effort in describing it as a variety of coronaria.

In my "Dendrologic Comments on Steyermark's 'Flora of Missouri'" in PHYTOLOGIA 12:1.1965 I mentioned trees of lancifolia that I had recently found in Clay County, Missouri; and I stated that the color of the anthers of lancifolia was deep pink or reddish pink and the color of the anthers of coronaria and ioensis was orange yellow--not red for both as stated by Steyermark. Regarding the shape of the leaves, there was confusion in herbaria because B. F. Bush distributed specimens of lancifolia from the type locality under the name of coronaria for years before lancifolia was described.

On 30 Sep. 1967 I revisited Rudolph Schmidt's farm in Kansas City North in Clay County and I found a new AFA champion Lanceleaf Crab Apple with a circumference of 3 feet 5 inches and a height of 29 feet.

Mr. Schmidt also has the AFA champions Prairie Crab Apple and Wildgoose Plum. Immediately south of his property in Gladstone is a relict colony of Sugar Maples, which contains the largest Sugar Maple in Missouri.

The Clay County Park and Recreation Commission was set up a few years ago to establish a county park system. A proposal for the commission to acquire this and two other tracts in the county was disapproved by the voters last October. There is local sentiment in favor of preserving Schmidt's trees and the Sugar Maples and it is hoped that they will be saved from residential construction produced by the growing population of Kansas City with attendant taxes.

All three species of Crab Apples are found in scattered colonies in the Indiana Dunes State Park at Tremont, Porter County, Indiana. One colony is on the south side of No. 10 trail west of its junction with No. 2. Appropriately enough, the trees on the west side of this colony are the Western species ioensis and the trees on the east side are the Eastern species coronaria. Both these species have irregular exfoliating strips of bark.

There is a colony of coronaria on the south side of No. 2 trail about 350 yards west of the point where it turns north into The Marsh.

At a place on the south side of No. 2 trail about

220 yards west of this turn there is a colony of Crab Apples that I thought for a long time were Sweet Crab Apples. I should have known better because the bark was regularly ridged and the trees were tall and straight. On 20 May 1963 I found a sapling that had been pulled down. I examined its flowers and found that the anthers were deep pink. After studying all the characters of this tree and nearby trees I found that all the trees in this colony were indeed lancifolia. The trees were typical of the species except for the venation of some of the leaves.

The leaf in the upper right corner on p. 112, Vol. 9, was taken from the largest tree in this colony of lancifolia, which died in the winter of 1966-7. I misidentified this one leaf as coronaria in the article.

This is the first time that I have found lancifolia east of Jackson and Clay Counties of Missouri.

The following page shows a revised Key to lancifolia and coronaria. I still regard the color of the anthers as the most important diagnostic character, as indicated by the weight, 8. It is of course necessary to see the newly opened flowers. I have added the bark as a character, which is quite distinctive and readily recognized.

There is no doubt that lancifolia is a distinct species and not a variety.

REVISED KEY TO MALUS LANCIFOLIA AND MALUS CORONARIA SHOWING
THEIR DIFFERENCES

| WEIGHT | CHARACTER | MALUS LANCIFOLIA | MALUS CORONARIA |
|--------|------------------------------------|--|---|
| 6 | Bark | Fissured into thin narrow vertical plates, not exfoliating | Dark gray, thin, irregular vertical exfoliating strips. |
| 4 | Leaf | Rounded, often semicircular. | Often broadly rectangular-cuneate or nearly so above the narrowly rounded or subcordate base. |
| | Blades:
Base | | |
| 1 | Lobation | Typically unlobed except for 1 pair of lobes 1-2(-4) mm wide (measured horizontally but not always present) at the distal end of the rounded base; or sometimes scarcely lobulate. | 4-7 pairs of rectangular, pointed, toothed lobes or lobules, the lowest pair usually the largest and appearing at three-eighths to one-half the distance from the base to the apex on lobed leaves. |
| 7 | Dimensions | Averaging 49% to 60% as wide as long. | Two-thirds to four-fifths as wide as long. |
| 1 | Color above | Moderate yellow green or olive green. | Dark greenish yellow or dark yellow. |
| 5 | Primary veins | Sometimes arcuate, leaving the midrib at irregular intervals and nearly buried in the parenchyma, usually forking and not reaching the margin of the leaf. | Straight, leaving the midrib at regular intervals and extending to the points of the lobes. |
| 2 | Flowers | 31-46 mm wide, blooming 6 days later than coronaria. | 30-40 mm wide. |
| 8 | Anthers | Deep pink or reddish pink. | Orange yellow. |
| 3 | Pubescence of lower side of sepals | Glabrous. | Pubescent or hoary-tomentose. |
| 1 | Pome | 21-28 mm high, 25-36 mm wide. | 20-25 mm high, 26-32 mm wide. |

ADDITIONAL MATERIALS TOWARD A MONOGRAPH OF THE GENUS CALLICARPA.

IX

Harold N. Moldenke

CALLICARPA L.

Additional & emended bibliography: Rumph., Herb. Amboin. 4: 114—118 & 123—125, pl. 58—60. 1743; Lam., Encycl. Méth. 1: 54 (1783) and 1: 562—563. 1785; Willd., Enum. Plant. Hort. Berol. 157—158. 1809; Roxb., Hort. Beng. [10] & [83]. 1814; Wall., Numer. List [50] (as "49"), nos. 1827—1835. 1829; Hook. & Arn., Bot. Beech. Voy. 205—206 & 268, pl. 46. 1836; Royle, Ill. Bot. Himal. 299. 1836; Hassk., Cat. Pl. Hort. Bot. Bogor. Cult. Alt. 136. 1844; Brandis, For. Fl. NW. & Cent. India 3: 368—369. 1874; Gamble, Man. Ind. Timb. 282—283 & 525. 1881; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 106, 386, & 1100. 1893; J. L. Stewart, Punjab Pl. 165. 1899; Collett, Fl. Siml. 380. 1902; Brandis, Ind. Trees 512. 1906; Duthie, Fl. Upper Gang. Plain 2: 215, 218—219, & 263. 1911; R. N. Parker, For. Fl. 397. 1918; Nakai, Trees & Shrubs Indig. Jap., ed. 1, 336—340. 1922; Betts, Jefferson's Gard. Book 23, 27, 30, 139, 140, & 672. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 106, 386, & 1100 (1946) and pr. 3, 1: 106, 386, & 1100. 1960; Chuang, Chao, Hu, & Kwan, Taiwania 1 (8): 54, 59, & 66, pl. 6, fig. 88. 1963; A. B. Chowdhury in Lahiri, West Beng. Forests 100. 1964; Anon., Ind. Bibliogr. Bot. Trop. 4: 54. 1967; R. R. Stewart, Pakistan Journ. Forest. 17: 515. 1967; Schuster, Southwest. Nat. 12: 344—345. 1967; Hocking, Excerpt. Bot. A. 11 (6): 503 & 505. 1967; Moldenke, Phytologia 16: 216—218. 1968.

It should perhaps be noted here that the H.B.K. reference dates given in the emended bibliography of this genus have been authenticated by consultation with Barnhart (1902). The plate illustration Rumphius' Frutex ceramicus in the library of the New York Botanical Garden is no. 59 (not "60") as claimed by Merrill.

The Hooker & Arnott references given in the bibliography above are often cited as "1841". Actually pages 193—288 and plates 40—59 were issued in 1836 and pages 289—384 with plates 60—79 in 1838. The Willdenow (1809) reference, also given above, is sometimes cited as "1808", but the correct date seems to be 1809.

Hyams (1967) tells us that the members of the genus Callicarpa [known to him] should be cultivated in acid soils rich in leaf-mold. Hellyet (1966) says that the cultivated species all tend to die back in especially cold and wet places and produce leaves that take on pink or purple hues before falling off in the autumn, that it is advisable to cut them back each spring, and that they may be propagated by seeds sown in the greenhouse in spring, by layers in the autumn, or by summer cuttings under mist. Lewis (1961) suggests that the basic chromosome number in this genus is $x = 9$.

The seeds of Callicarpa are described by Martin & Bradley (1961) — apparently based only on an examination of those of C. americana — as elliptic, flattish or concave-convex, narrowly margined on the concave side and with a central attachment scar, white to light-brown, and 1.5—2.5 mm. long.

CALLICARPA ACULEOLATA Schau.

Additional bibliography: Moldenke, *Phytologia* 14: 219. 1967; Hocking, *Excerpt. Bot. A.ll* (6): 505. 1967.

CALLICARPA ACUMINATA H.B.K.

Additional bibliography: Hocking, *Excerpt. Bot. A.ll* (6): 505. 1967; Moldenke, *Phytologia* 16: 218. 1968.

Roe and his associates found this plant growing on steep moist north-facing limestone talus slopes with a dense canopy and with many lianas and epiphytes in tropical evergreen forest vegetation on rolling hills in San Luis Potosí, Mexico, while Carter & Chisaki describe it as a tall slender shrub, 2—4 m. tall, growing in dense forests alongside of trails in Jalisco, fruiting in March.

Additional citations: MEXICO: Jalisco: Carter & Chisaki 1260 (Ml). San Luis Potosí: Roe, Roe, & Mori 209 (Ml). PERU: San Martín: Belshaw 3148 (Rf).

CALLICARPA ALONGENSIS Dop

Additional bibliography: P. Dop, *Trav. Lab. For. Toulouse 1* [Artic. Divers. 1] (21): 9, 10, 18, 20, & 21. 1932; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14354. 1958; Moldenke, *Phytologia* 13: 438—439. 1966.

CALLICARPA AMERICANA L.

Additional bibliography: Robin, *Fl. Louis.* 384. 1807; Willd., *Enum. Plant. Hort. Berol.* 157—158. 1809; Raf., *Fl. Ludovic.*, pr. 1, 38—39. 1817; H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: 204 (1817) and ed. quart., 2: 252. 1818; Schnitzl., *Icon. Fam. Nat. Reg. Veg.* 137. 1856; Meehan, *Meehan's Monthly* 11: 129—130, pl. 9. 1901; Barnhart, *Bull. Torrey Bot. Club* 29: 590. 1902; Beissner, Schelle, & Zabel, *Handb. Laubh.* 425. 1903; Schelle, *Pareys Blumengärtn.*, ed. 1, 2: 278. 1932; Rendle, *Notes Fl. Bermuda* 18. 1937; Hylander, *Macm. Wild Flow. Book* 340. 1954; Krüssmann in *Pareys Blumengärtn.*, ed. 2, 2: 445. 1960; Martin & Bradley, *Seed Ident. Man.* 115 & 195, fig. 261 & 792. 1961; W. H. Lewis, *Southwest Nat.* 6: 47—48, fig. 1. 1961; Cave, *Ind. Pl. Chromosome Numb.* 2: 136. 1961; Batson, *Wild Fls. S. C.* 100. 1964; N. Taylor, *Guide Gard. Shrubs & Trees* 340—341 & opp. 342, fig. 4. 1965; Chopra, Badhwar, & Ghosh, *Poison. Pl. India* 2: 695. 1965; S. A. Manning, *Syst. Guide Flow. Pl.* 18 & 142. 1965; Moldenke, *Phytologia* 15: 14—15, 24, 28, & 30. 1967; Moldenke, *Résumé Suppl.* 15: 1, 2, & 14. 1967; H. Marsh., *Arbust. Amer.*, ed. Ewan, 22—23. 1967; Raf., *Fl. Ludovic.*, pr. 2, 38—39. 1967; P. Gray, *Dict. Biol. Sci.* 315. 1967; Schuster, *Southwest. Nat.* 12: 344—345. 1967; Hocking, *Excerpt. Bot. A.ll* (6): 505. 1967.

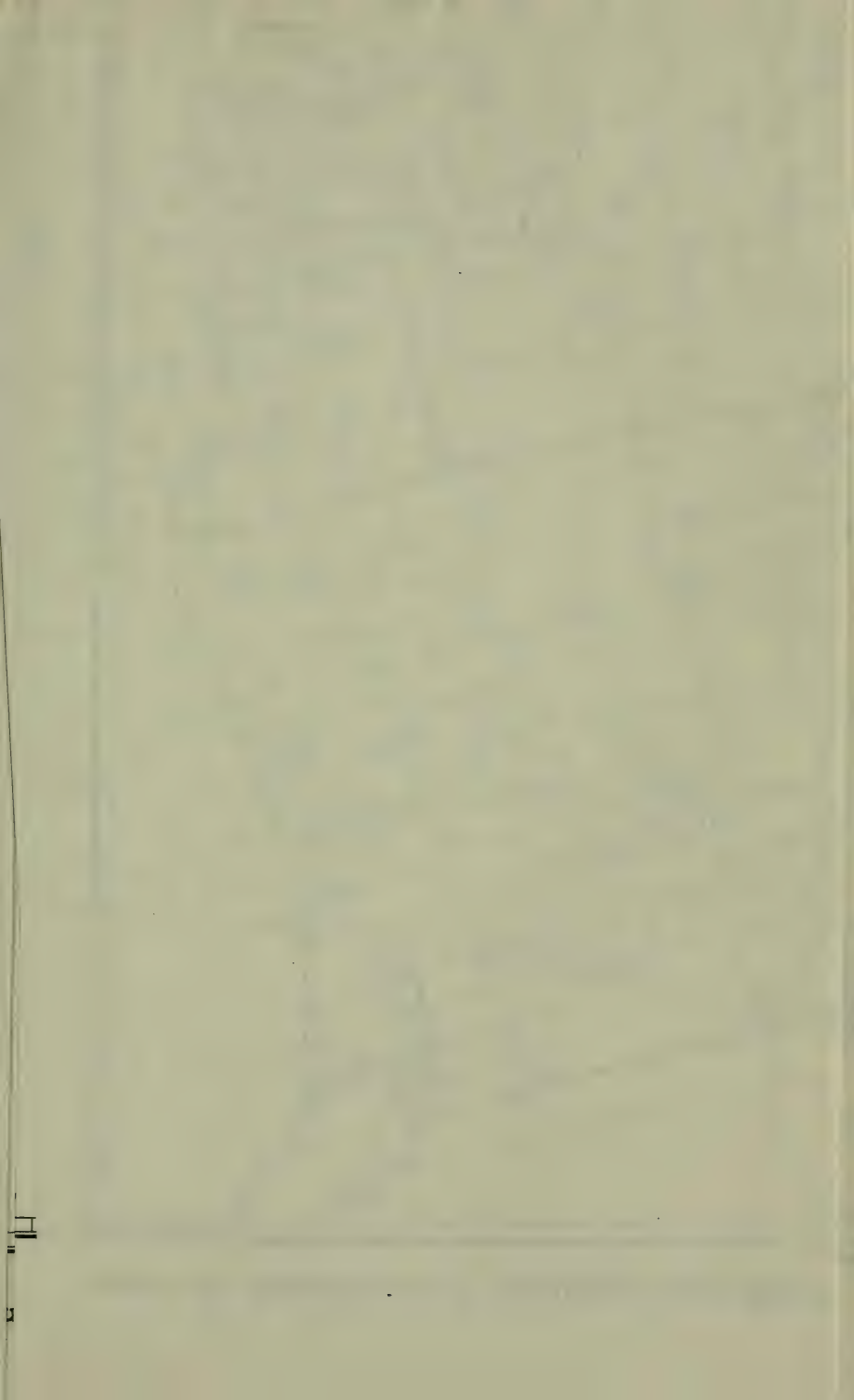


Figure 21. Distribution of *Callicarpa americana* in the United States

Herbarium curators who have material of this species from additional counties are asked to send it to the author for verification and record, so that future editions of this map may be more complete

Mapping by counties done by Andrew R. Moldenke



Additional illustrations: Meehan, Meehan's Monthly 11: pl. 9 [in color]. 1901; Martin & Bradley, Seed Ident. Man. fig. 261 & 792. 1961; W. H. Lewis, Southwest. Nat. 6: 47, fig. 1. 1961; Batson, Wild Fls. S. C. 100 [in color]. 1964; N. Taylor, Guide Gard. Shrubs & Trees opp. 342, fig. 4 [in color]. 1965.

The Willdenow (1809) reference given in the bibliography above is sometimes erroneously cited as "1808". In Germany this species is often called "amerikanische Schönfrucht".

Taylor (1965) emphasizes that *C. americana* is easily distinguished by its flower-stalks being shorter than the petioles. He avers that the plants are persistent from year to year from Life Zone 5 southward in North America. Chopra, Badhwar, & Ghosh (1965) report that the species is "said to be poisonous". Manning (1965) tells us that its flowers are pollinated "by insects", including bees, and that its seeds are without endosperm. Hylander (1954) reports that it blooms from June through August. Betts (1944) tells us that it was cultivated in Thomas Jefferson's garden and is mentioned by him in his garden record book on September 30, 1771.

Krüssmann (1960) gives the distribution of the species very accurately as "Maryland bis Arkansas, südlich bis Florida, Texas und Mexiko, Bermudas, Bahama-Inseln, Westkuba; in Wäldern, feuchten Gebüschen, Sumpfrändern usw., Juni, Juli". He states that it was introduced into cultivation in 1724.

Lewis (1961) and Cave (1961) report the haploid chromosome number as 18, based on Lewis & Oliver 5232 & 5244 from Nacogdoches and Angelina Counties, Texas. Lewis suggests that the species is a tetraploid one.

Additional citations: NORTH CAROLINA: Scotland Co.: Ahles 37009 (Ms—46746). FLORIDA: Duval Co.: Curtiss 1971 [June] (Ms—30938), 1971 [Sept.] (Ms—30938), s.n. [June 1876] (Ms—7177); Edw. Palmer 402 (M1). Gadsden Co.: Herb. Amherst Coll. 30939 (Ms). Manatee Co.: S. M. Tracy 7534 (M1). ARKANSAS: Miller Co.: Heller & Heller 4158 (Ms—30940). LOUISIANA: East Baton Rouge Par.: Joor s.n. [East Baton Rouge] (Ms—34125). TEXAS: Tyler Co.: Tharp, Gimbrede, & Yang 51-1465 (Ms—34124). Wilson Co.: Edw. Palmer 1054 (Ms—30941).

CALLICARPA AMERICANA var. *LACTEA* F. J. Muller

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14354. 1958; N. Taylor, Guide Gard. Shrubs & Trees 341. 1965; Moldenke, Phytologia 15: 14—15. 1967; Hocking, Excerpt. Bot. A.11 (6): 505. 1967.

CALLICARPA ANGUSTA Schau.

Additional bibliography: Moldenke, Phytologia 15: 15. 1967; Moldenke, Résumé Suppl. 15: 11. 1967.

CALLICARPA ARBOREA Roxb.

Additional & emended bibliography: Watt, Econ. Prod. India 5: 68

(1883) and 7: 54. 1883; Prain, Beng. Pl., ed. 1, 2: 827. 1903; Duthie, Fl. Upper Gang. Plain 2: 219. 1911; Haines, Bot. Bihar & Orissa 4: 709. 1922; Gamble, Fl. Presid. Madras 6: 1091 & 1092. 1924; P'ei, Sinensia 2: [65]—66. 1932; Deb, Bull. Bot. Surv. India 3: 314. 1961; Panigrahi & Naik, Bull. Bot. Surv. India 3: 376. 1961; Prain, Beng. Pl., ed. 2, 2: 617 & 618. 1963; Legris, Trav. Sect. Scient. Inst. Franç. Pond. 6: 213, 501, 513, 542, & 558. 1963; Bhatnagar, Journ. Indian Bot. Soc. 42: 369 & 374. 1963; A. B. Chowdhury in Lahiri, West Beng. Forest 100. 1964; Datta, Handb. Syst. Bot. 181. 1965; Banerji, Rec. Bot. Surv. India 8: 4. 1966; Moldenke, Phytologia 15: 15—15. 1967; Moldenke, Résumé Suppl. 15: 8 & 11. 1967; Hocking, Excerpt. Bot. A. 11 (6): 505. 1967.

Datta (1965) describes this plant as a tree, 12 m. tall. Bhatnagar (1963) calls it a rare evergreen tree in the low-lying areas of Assam. An additional vernacular name recorded for it is "bormalla". Panigrahi & Naik (1961) describe the tree as growing to a height of 13—15 m., the leaves being dark-green above, whitish beneath, and the flowers greenish-white. They cite Pitepool 19632. Deb (1961) comments that this is one of the first species of plants to invade abandoned "jhum" land and other bare hill lands in Manipur, India. He cites his numbers 39, 1404, 1938, and 2615.

Chowdhury (1964) reports that this species comprises about 1.63 percent of scattered Shorea robusta and wet mixed forests in some parts of India, 0.1 percent of plain wet mixed forests, and 8.2 percent of dry mixed forests.

Material has been misidentified and distributed in herbaria as C. macrophylla Vahl.

Additional citations: INDIA: Madras: Herb. Mus. Paris. s.n. [Coromandel] (W—2496742).

CALLICARPA AREOLATA Urb.

Additional bibliography: Moldenke, Phytologia 14: 42 (1966) and 14: 238. 1967.

CALLICARPA AUSTRALIS Koidz.

Additional bibliography: Nakai, Fl. Sylv. Korean. 14: 31 & 133. 1923; Hara, Emm. Sperm. Jap. 1: 184. 1948; Ohwi, Fl. Jap. 764. 1965; Moldenke, Phytologia 14: 42—43. 1966.

Nakai (1923), Hara (1948), and Ohwi (1965) reduce this taxon to synonymy under C. japonica var. luxurians Rehd.

CALLICARPA BARBATA Ridl.

Additional bibliography: Moldenke, Phytologia 14: 43—44. 1966; Van Steenis, Blumea 15: 149. 1967.

CALLICARPA BICOLOR A. L. Juss.

Additional bibliography: Moldenke, Phytologia 15: 16—18 & 22. 1967; Moldenke, Résumé Suppl. 15: 11. 1967.

CALLICARPA BICOLOR var. BERMEJOSI Moldenke

Additional bibliography: Moldenke, *Phytologia* 15: 17 & 19. 1967; Moldenke, *Résumé Suppl.* 15: 11. 1967.

CALLICARPA BICOLOR var. SUBINTEGRIFOLIA Moldenke

Additional bibliography: Moldenke, *Phytologia* 15: 17—18 & 24. 1967; Moldenke, *Résumé Suppl.* 15: 11. 1967.

CALLICARPA BODINIERI Lévêillé

Additional & emended bibliography: Krüssmann in Pareys *Blumengärtn.*, ed. 2, 2: 445 & 446. 1960; Hellyer, *Shrubs in Colour*, pr. 1, 20 & 22 (1965) and pr. 2, 20 & 22. 1966; Moldenke, *Phytologia* 15: 18—19, 30—32, 38, & 39. 1967; Moldenke, *Résumé Suppl.* 15: 10, 14, & 16. 1967; J. F. Williamson, *Sunset West. Gard. Book*, new ed., 207. 1967; E. Hyams, *Ornam. Shrubs Temp. Zone 5*: 27. 1967.

The Bodinier specimen cited below probably represents cotype material, but its label does not plainly indicate this.

Additional citations: CHINA: Kweichow: Bodinier s.n. (W—2496754).

CALLICARPA BODINIERI var. GIRALDII (Hesse) Rehd.

Additional & emended bibliography: W. J. Bean, *Garden* 88: 184. 1924; Pfei, *Sinensia* 2: 66—67. 1932; Schelle, Pareys *Blumengärtn.*, ed. 1, 278. 1932; Moldenke, *Known Geogr. Distrib. Verbenac.*, ed. 1, 56, 58, 71, 86, & 87. 1942; H. N. & A. L. Moldenke, *Pl. Life* 2: 61 & 71. 1948; Moldenke, *Known Geogr. Distrib. Verbenac.*, ed. 2, 130, 131, 135, 156, & 177. 1949; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14354. 1958; Moldenke, *Résumé* 167, 168, 174, 213, 241, 243, 244, 443, & 444. 1959; Krüssmann in Encke, Pareys *Blumengärtn.*, ed. 2, 2: 445. 1960; Hellyer, *Shrubs in Colour*, pr. 1, 20 & 22 (1965) and pr. 2, 20 & 22. 1966; Moldenke, *Phytologia* 15: 18, 30—32, 38, & 39. 1967; Moldenke, *Résumé Suppl.* 15: 14 & 16. 1967; J. F. Williamson, *Sunset West. Gard. Book*, new ed., 207. 1967; E. Hyams, *Ornam. Shrubs Temp. Zone 5*: 27. 1967.

Additional illustrations: Schelle, Pareys *Blumengärtn.*, ed. 1, 2: 278. 1932; Hellyer, *Shrubs in Colour*, pr. 1, 22 [in color] (1965) and pr. 2, 22 [in color]. 1966.

Hyams (1967) tells us that the leaves of this plant turn "a soft madder-pink" before falling in the autumn and that giraldii was introduced from China in 1907 [actually in 1848!]. The popular name for the plant in Germany is "Giralds Schönfrucht".

Krüssmann (1960) cites as illustrations "M. D. 1912: 366" and "R. H. 1923: 391", but this does not exactly correspond to the citations given by me in *Phytologia* 14: 56 (1966). The first apparently refers to Hesse, *Mitt. Deutsch. Dendrol. Gesell.* 21: 368 & 369 (1912) and the second to Mottet, *Rev. Hort.* 94: opp. 390 (1923). He describes the variety as "Sehr winterhart und schön".

The C. longifolia Hance referred to in the synonymy of this variety should be dated "1890" rather than "1932" as it is in *Phytologia* 14: 55 (1966), while that credited to Bentham should be

dated "1962", not "1966".

CALLICARPA BREVIPES (Benth.) Hance

Additional bibliography: Moldenke, *Phytologia* 15: 19 & 39. 1967; Moldenke, *Résumé Suppl.* 15: 12. 1967.

The Boeea 8017, cited as C. brevipes in *Phytologia* 14: 103 (1966), is actually C. brevipetiolata Merr. instead.

The C. longifolia Hance, referred to in the synonymy of C. brevipes, should be dated "1890", rather than "1932", while that accredited to Benthham should be dated "1962", not "1966".

CALLICARPA BREVIPETIOLATA Merr.

Additional bibliography: Moldenke, *Phytologia* 15: 19. 1967.

The Boeea 8017, cited below, was previously incorrectly cited by me as C. brevipes (Benth.) Hance, which is closely resembles.

Additional citations: INDONESIA: GREATER SUNDA ISLANDS: Sumatra: Boeea 8017 (S).

CALLICARPA CANDICANS (Burm. f.) Hochr.

Additional synonymy: Callicarpa candicans var. typica Hochr., *Candollea* 5: 190. 1934. Callicarpa canadicans Kawazu, Inaba, & Mitsui, *Biol. Abstr.* 48: 8109, sphalm. 1967. Callicarpa candicans Hochr. ex Kawazu, Inaba, & Mitsui, *Agr. Biol. Chem.* 31: 496. 1967.

Additional & amended bibliography: Willd., *Enum. Plant. Hort. Berol.* 158. 1809; Roxb., *Hort. Beng.* [10]. 1814; Watt, *Econ. Prod. India* 7: 54. 1883; Prain, *Beng. Pl.*, ed. 1, 2: 827 & 828. 1903; A. Chev., *Cat. Pl. Jard. Bot. Saigon* 35. 1919; Hosokawa, *Journ. Soc. Trop. Agr. Taiwan* 6: 205. 1934; Prain, *Beng. Pl.*, ed. 2, 2: 617 & 618. 1963; Bose, *Handb. Shrubs* 17, 34, & 104. 1965; Moldenke, *Phytologia* 15: 19—20 & 23. 1967; Moldenke, *Résumé Suppl.* 15: 10, 14, & 16. 1967; Anon., *Biol. Abstr.* 48 (18): S.27. 1967; Kawazu, Inaba, & Mitsui, *Agr. Biol. Chem.* 31: 494—506. 1967; Kawazu, Inaba, & Mitsui, *Biol. Abstr.* 48: 8109. 1967.

The Willdenow (1809) reference given in the bibliography above was previously incorrectly cited by me as "1808".

Prain (1963) tells us that this species is often cultivated in Bengal and is even naturalized in central Bengal, but is actually native to the Malay Peninsula. Bose (1965) states that in India this species is hardy and quick-growing, propagated by cuttings, and that it should be pruned in the early rains after flowering.

Kawazu and his associates (1967) have isolated a fish-killing compound which was named callicarpones, $C_{20}H_{28}O_4$, from the leaves of this species. Its toxicity to fish is as strong as that of rotenone and ten times stronger than that of sodium pentachlorophenoxide.

Chevalier (1919) records the additional vernacular name "nàng nằng" for the species in Vietnam.

The Herb. Hort. Bot. Calcutt. s.n. and Steward & Chao 876, distributed as C. candicans, are actually C. macrophylla Vahl.

Additional citations: INDOCHINA: Vietnam: Demange 1173 (W--2496565). INDONESIA: LESSER SUNDA ISLANDS: Timor: Herb. Cosson s.n. (W--2496745).

CALLICARPA CAUDATA Maxim.

Additional bibliography: Moldenke, *Phytologia* 15: 20. 1967; Moldenke, *Résumé Suppl.* 15: 11. 1967.

CALLICARPA CAULIFLORA Merr.

Additional bibliography: Moldenke, *Phytologia* 15: 20. 1967; Van Steenis, *Blumea* 15: 151. 1967.

CALLICARPA CRASSINERVIS Urb.

Additional bibliography: Moldenke, *Phytologia* 15: 20. 1967; Moldenke, *Résumé Suppl.* 15: 17. 1967.

The Carabia 3803, distributed as C. crassinervis, is actually C. lancifolia Millsp.

CALLICARPA CUBENSIS Urb.

Additional bibliography: Moldenke, *Phytologia* 14: 149--155. 1966; Moldenke, *Résumé Suppl.* 15: 17. 1967.

CALLICARPA DENTICULATA Merr.

Additional bibliography: Moldenke, *Phytologia* 14: 155--156. 1966; Moldenke, *Résumé Suppl.* 15: 11. 1967.

CALLICARPA DICHOTOMA (Lour.) K. Koch

Additional synonymy: Callicarpa dlchotoma (Lour.) Raeusch. apud Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 25, sphalm. 1921. Calycarpon gracilis A. Br., in herb.

Additional bibliography: Beissner, Schelle, & Zabel, *Handb. Laubh.* 425. 1903; Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 25--26 & 125. 1921; P'ei, *Sinensia* 2: 68. 1932; Hara, *Enum. Sperm. Jap.* 1: 182--183. 1948; Kitamura & Okamoto, *Col. Illustr. Trees & Shrubs Japan* 220, pl. 65. 1960; Krüssmann in Encke, Pareys *Blumengärtn.*, ed. 2, 2: 445. 1960; Ohwi, *Fl. Jap.* 764. 1965; N. Taylor, *Guide Gard. Shrubs & Trees* 340. 1965; R. E. & C. R. Harrison, *Know Your Trees* 39, pl. 93. 1965; Moldenke, *Phytologia* 15: 20--21, 29--32, 34, 36, & 39. 1967; Moldenke, *Résumé Suppl.* 15: 8, 14, 16, 17, & 20. 1967; J. F. Williamson, *Sunset West. Gard. Book*, new ed., 207. 1967.

Additional illustrations: Kitamura & Okamoto, *Col. Illustr. Trees & Shrubs Japan* pl. 65 [in color]. 1960; N. Taylor, *Guide Gard. Shrubs & Trees* 340. 1965.

In Germany this species is called "purpurblütige Schönfrucht"! Ohwi calls it "ko-shikibu".

Taylor (1965) emphasizes that in this species the peduncles are longer than the petioles which subtend them. He says that the plant is "persistent" [hardy] from Life Zone 5 southward in the United States.

The cheironymous binomial, Calycarpon gracilis, is based on

the Addison Brown collection cited below. Krüssmann (1960) cites as an illustration "Gn. 23: 540". Perhaps he refers here to W. Robinson, The Garden 23: pl. 392 (1883).

The Richardson s.n. [Liverpool Bot. Gard., Oct. 4, '89], distributed as C. dichotoma, is actually C. rubella Lindl.

Additional citations: CULTIVATED: New York: Addison Brown s.n. (Ms--30942).

CALLICARPA ELEGANS Hayek

Additional bibliography: Moldenke, Phytologia 15: 21--22. 1967; Moldenke, Résumé Suppl. 15: 12, 16, & 17. 1967.

CALLICARPA ERIOCLONA Schau.

Additional synonymy: Callicarpa tomentosa L. ex Moldenke, Résumé 247, in syn. 1959 [not C. tomentosa Bakh., 1932, nor Hook. & Arn., 1918, nor König, 1893, nor "L. [ex Spreng.]", 1825, nor "L. [ex Willd.]", 1966, nor (L.) Murr., 1774, not (L.) Santapau, 1965, nor Lam., 1783, nor Murr., 1774, nor Thunb., 1959, nor Vahl, 1794, nor Willd., 1809, nor "sensu Matsum.", 1964].

Additional bibliography: Moldenke, Phytologia 15: 22--23. 1967; Moldenke, Résumé Suppl. 15: 11--13 & 16. 1967.

The C. tomentosa ascribed to Bakhuizen van den Brink in the synonymy above is a synonym in part of C. arborea Roxb. and in part of C. integerrima Champ., that ascribed to Hooker & Arnott, to Willdenow, and to Matsumura is C. kochiana Mak., that ascribed to König is C. macrophylla Vahl, that ascribed to Linnaeus "ex Sprengel" and to Lamarck is C. candicans (Burm. f.) Hochr., that ascribed to Linnaeus "ex Willdenow", to Murray, and to "(L.) Santapau" is C. tomentosa (L.) Murr., a valid species, that ascribed to Thunberg is C. longifolia Lam., while that credited to Vahl is as yet undetermined.

CALLICARPA ERIOCLONA f. GLABRESCENS Moldenke

Additional bibliography: Moldenke, Phytologia 15: 23. 1967; Moldenke, Résumé Suppl. 15: 12. 1967.

CALLICARPA ERIOCLONA var. PAUCINERVIA (Merr.) Moldenke

Additional bibliography: Hosokawa, Journ. Soc. Trop. Agr. Taiwan 6: 206. 1934; Moldenke, Phytologia 15: 23. 1967; Van Steenis-Kruseman, Fl. Males. Bull. 4: 1069. 1967; Moldenke, Résumé Suppl. 15: 12. 1967.

CALLICARPA FORMOSANA Rolfe

Additional bibliography: Kanehira & Hatusima, Bot. Mag. Tokyo 56: 113. 1942; Li & Keng, Taiwania 1 (2--4): 127. 1950; Lee & Keng, Taiwania 1 (5): 5. 1954; Chuang, Chao, Hu, & Kwan, Taiwania 1 (8): 54, 58, & 63, pl. 3, fig. 39. 1963; Cave, Ind. Pl. Chromosome Numb. 2: 330. 1964; Moldenke, Phytologia 15: 24--26 & 32. 1967; Moldenke, Résumé Suppl. 15: 10, 11, & 16. 1967.

Additional illustrations: Chuang, Chao, Hu, & Kwan, Taiwania

1 (8): 63, pl. 3, fig. 39. 1963.

The Degeners found this plant growing in open woods on Formosa. Lee & Keng (1954) tell us that it is common at altitudes of 300 to 550 meters on that island. Cave (1964) reports the haploid number of chromosomes as 18.

Kanehira & Hatusima (1942) think that C. formosana should be reduced to synonymy under C. longifolia Lam., but with this I cannot possibly agree! The two taxa are very distinct from each other. That it may be conspecific with C. pedunculata R. Br., as claimed by other workers, is very possible.

The Tso 20752, distributed as C. formosana, is actually C. longipes Dunn.

Additional citations: FORMOSA: Degener & Degener 28978 (Ms--50131).

CALLICARPA FORMOSANA f. ALBIFLORA Yamamoto

Additional bibliography: Moldenke, *Phytologia* 15: 25. 1967; Moldenke, *Résumé Suppl.* 15: 10 & 11. 1967.

The McClure 3038 [Herb. Canton Chr. Coll. 9591], cited by me as this form in *Phytologia* 14: 228 (1967), is actually a cotype collection of C. rubella f. robusta P'ei, a taxon which is apparently very similar to C. formosana in general appearance and concerning whose validity I have serious doubts.

CALLICARPA FORMOSANA f. ANGUSTATA Moldenke

Additional bibliography: Moldenke, *Phytologia* 15: 25. 1967; Moldenke, *Résumé Suppl.* 15: 16. 1967.

CALLICARPA FORMOSANA f. PARVIFOLIA Moldenke

Additional bibliography: Moldenke, *Phytologia* 15: 26. 1967; Moldenke, *Résumé Suppl.* 15: 11. 1967.

CALLICARPA FULVA A. Rich.

Additional bibliography: Moldenke, *Phytologia* 15: 26. 1967; Moldenke, *Résumé Suppl.* 15: 16. 1967.

CALLICARPA FULVOHIRSUTA Merr.

Additional bibliography: Moldenke, *Phytologia* 14: 234--235. 1967; Moldenke, *Résumé Suppl.* 15: 17. 1967; Van Steenis, *Blumea* 15: 149. 1967.

CALLICARPA GLABRA Koidz.

Additional bibliography: Hosokawa, *Journ. Soc. Trop. Agr. Taiwan* 6: 205. 1934; Moldenke, *Phytologia* 14: 235--237. 1967.

CALLICARPA HAVILANDII (King & Gamble) H. J. Lam

Additional synonymy: Callicarpa havilandi Ridl., *Kew Bull. Misc. Inf.* 1929: 260. 1929.

Additional bibliography: Moldenke, *Phytologia* 15: 26. 1967; Moldenke, *Résumé Suppl.* 15: 17. 1967; Van Steenis, *Blumea* 15:

148 & 149, fig. 2K. 1967.

Illustrations: Van Steenis, *Blumea* 15: 148, fig. 2K. 1967.

CALLICARPA INAEQUALIS Teijsm. & Binn.

Additional bibliography: Moldenke, *Phytologia* 14: 241--243. 1967; Moldenke, *Résumé Suppl.* 15: 17. 1967.

CALLICARPA INTEGERRIMA Champ.

Additional bibliography: P'ei, *Sinensia* 2: 66. 1932; Moldenke, *Phytologia* 15: 27. 1967.

Additional citations: HONGKONG: Bodinier 682 (W--2496748).

CALLICARPA INVOLUCRATA Merr.

Additional bibliography: Moldenke, *Phytologia* 14: 246--248. 1967; Van Steenis, *Blumea* 15: 149 & 151. 1967.

Van Steenis (1967) speaks of this species as "A remarkable species with cauliflorous and ramiflorous inflorescences. The flowers are borne in fascicles either axillary or in fascicles or clusters on knobs on the stem and twigs; by absence of fruit setting they appear to grow into thick, woody, brachyblasts lengthening to 15 cm, with fascicles on top, a situation similarly found in *Rapatea*, *Deltaria*, etc. From related species easily distinct by entirely glabrous leaves and twigs, a multitude of (in sicco) immersed dots on both leaf surfaces, each with a fine, globular, yellow gland, and a more or less swollen upper leaf base with few to many flat-crateriform, sessile, larger, prominent glands. A small tree 3--5 m with pale ochraceous papery bark; flowers white, berries white then red. Stamens 4. Seed surrounded by a corky tissue.

"Whether *f. clemensae* Bakh., found on Mt. Kinabalu at c. 1500 m, is tenable is doubtful; the smaller leaves seem to be the only difference. To the same affinity belong *C. cauliflora* Merr. and *C. ramiflora* Merr. from the Philippines, both according to Merrill erroneously reduced to *C. pentandra* Roxb. They are brown-haired species." He cites from Borneo "BRUN 5248 Ashton; R. Soc. Exp. 1647 Chew, Corner & Stainton; SAN A 3986 G. H. S. Wood; Erdert 3836, 3742, 3651; SAR K 79 Anderson & Keng" and cites "M. Ramos 1523" as the type. The type of the species, however, is actually not that number -- it is *M. Ramos* 1395, as is plainly stated by Merrill in the original publication. Van Steenis is also in error in referring to the fruits of this plant as "berries"; they are drupes.

CALLICARPA JAPONICA Thunb.

Additional & emended synonymy: *Callicarpa purpurea* A. L. Juss., *Ann. Mus. Hist. Nat. Paris* 7: 67. 1806 [not *C. purpurea* Hort. ex Lem., 1859, nor Hort. ex Moldenke, 1941, nor Van Houtte, 1932]. *Callicarpa mimurazaki* Sieb. ex Beissner, Schelle, & Zabel, *Handb. Laubh.* 425. 1903. *Callicarpa americana* Thunb. apud Nakai, *Bot. Mag. Tokyo* 40: 491, in syn. 1926 [not *C. americana* Blanco, 1884, nor Hort., 1936, nor L., 1753, nor Lam., 1966,

nor Lour., 1794, nor Roxb., 1945, nor Sessé & Moc., 1893, nor Willd., 1820]. Callicarpa mimurazakii Hellyer, Shrubs in Colour 20, in syn. 1966.

Additional & emended bibliography: Lavallée, Arb. & Arbriss. 179. 1877; Beissner, Schelle, & Zabel, Handb. Laubh. 425. 1903; W. J. Bean, Garden 88: 184. 1924; Nakai, Bot. Mag. Tokyo 40: 491-492. 1926; Nakai in Nakai & Koidz., Trees & Shrubs Indig. Jap., ed. 2, 1: 452, 454, & 456, fig. 214 & 215. 1927; Schnelle, Pareys Blumengärtn., ed. 1, 2: 278. 1932; Masam. & Suzuki, Ann. Rep. Taih. Bot. Gard. 3: 66. 1933; Chun, Sunyat. 1: 303. 1934; K. Mori in Masam., Short Fl. Formos. 179. 1936; Terazaki, Suppl. Illustr. Fl. Jap. fig. 2482. 1938; Plouvier, Compt. Rend. Acad. Sci. Paris 231: 1546-1548. 1950; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14354. 1958; Kitamura & Okamoto, Col. Illustr. Trees & Shrubs Japan 220, pl. 65. 1960; Krtissmann in Encke, Pareys Blumengärtn., ed. 2, 2: 445. 1960; W. H. Lewis, Southwest. Nat. 6: 47 & 48. 1961; N. Taylor, Guide Gard. Shrubs & Trees 341. 1965; Ohwi, Fl. Jap. 764. 1965; Hellyer, Shrubs in Colour, pr. 1, 20 (1965) and pr. 2, 20. 1966; Moldenke, Phytologia 15: 27-41. 1967; Moldenke, Résumé Suppl. 15: 10, 11, 14, & 17. 1967; E. Hyams, Ornam. Shrubs Temp. Zone 5: 27. 1967; Hocking, Excerpt. Bot. A.11 (6): 503. 1967.

Additional illustrations: Kitamura & Okamoto, Col. Illustr. Trees & Shrubs Japan pl. 65 [in color]. 1960; Krtissmann in Encke, Pareys Blumengärtn., ed. 2, 2: 445. 1960;

Hellyer (1966) places the binomial, C. arnoldiana Keisey, in the synonymy of C. japonica, but it actually belongs in that of C. bodinieri var. giraldii (Hesse) Rehd., as has been pointed out by me previously. Beissner, Schelle, & Zabel (1903) place C. longifolia Lam. and C. longifolia subglabrata Schau. in the synonymy of C. japonica, but this, in my opinion, is unjustified. The two taxa are abundantly distinct. They call the species "japanische Schönfrucht".

The C. purpurea ascribed to "Hort." ex Lemaire is actually C. longifolia Lam., that ascribed to Van Houtte and to "Hort." ex Moldenke is C. rubella Lindl., while that proposed by A. L. Jus-sieu is C. dichotoma (Lour.) K. Koch.

Taylor (1965) describes the corollas of C. japonica as "white or pink" and maintains that the plant is hardy from Life Zone 5 southward in the United States. Hyams (1967) tells us that the leaves turn "pale red" before falling in the autumn and that the species was introduced into cultivation from Japan in 1845 [actually in 1841].

Lewis (1961) reports the diploid chromosome number as 16 and 18, but suggests that 18 is the correct figure. Nakai (1923) cites a "Nakai, Isl. Wangto 13 & 24", but I have not yet been able to trace this reference.

The Herb. St. Petersburg s.n., Matsuki 172, J. Matsumura s.n. [Tokio, June 29, 1879], and C. Wright s.n. [Kiusiu], distributed as C. japonica, are all actually var. luxurians Rehd., while

Takeuchi 11 and Zimmermann 210 are var. rhombifolia H. J. Lam.

Additional citations: WESTERN PACIFIC ISLANDS: JAPAN: Honshiu: Savatieu s.n. [Yokoska] (W--2496743).

CALLICARPA JAPONICA f. ALBIBACCA Hara

Additional synonymy: Callicarpa japonica fructo-albo Hort. ex Beissner, Schelle, & Zabel, Handb. Laubh. 425, nom. nud. 1903. Callicarpa japonica cv. "Albibacca" Krüssmann in Encke, Pareys Blumengärtn., ed. 2, 2: 445. 1960. Callicarpa japonica cv. "Leucocarpa" Krüssmann in Encke, Pareys Blumengärtn., ed. 2, 2: 445, in syn. 1960.

Additional bibliography: Beissner, Schelle, & Zabel, Handb. Laubh. 425. 1903; Krüssmann, Handb. Laubgeh. 1: 255. 1959; Moldenke, Phytologia 15: 34--36. 1967; Moldenke, Résumé Suppl. 15: 17. 1967.

Krüssmann (1960) comments "Früchte weiss; in Aussaaten immer wieder auftretend".

CALLICARPA JAPONICA f. ALBIFLORA Moldenke

Additional bibliography: Moldenke, Phytologia 15: 21 & 36. 1967; Moldenke, Résumé Suppl. 15: 10. 1967; Hocking, Excerpt. Bot. A.11 (6): 503. 1967.

CALLICARPA JAPONICA var. ANGUSTATA Rehd.

Additional bibliography: Chun, Suryat. 1: 303. 1934; Krüssmann in Encke, Pareys Blumengärtn., ed. 2, 2: 445. 1960; Moldenke, Phytologia 15: 36--41. 1967; Moldenke, Résumé Suppl. 15: 17. 1967.

The C. longifolia Hance, referred to in the synonymy of this variety, should be dated "1890", rather than "1932", while that accredited to Benthham should be dated "1962", not "1966".

CALLICARPA JAPONICA var. ERYTHROCARPA Sieb., Jaarb. Konink.

Nederl. Maatschap. Aarmoed. Tuinb. 1845: 71, pl. 6 [as "varieteit α C. erythrocarpa"]. 1845; Moldenke, Prelim. Alph.

List Invalid Names 10. 1940.

Synonymy: Callicarpa erythrocarpa Sieb., Jaarb. Konink. Nederl. Maatschap. Aarmoed. Tuinb. 1845: 71, pl. 6. 1845. Callicarpa japonica α C. erythrocarpa Sieb. apud Rehd., Bibl. Cult. Trees 584. 1949.

Bibliography: Sieb., Jaarb. Konink. Nederl. Maatschap. Aarmoed. Tuinb. 1845: 71, pl. 6. 1845; Moldenke, Prelim. Alph. List Invalid Names 10. 1940; Moldenke, Alph. List Invalid Names 9. 1942; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 58 & 87 (1942) and ed. 2, 133 & 177. 1949; Rehd., Bibl. Cult. Trees 584. 1949; Moldenke, Résumé 172, 243, 244, & 444. 1959; Moldenke, Phytologia 14: 254. 1967.

Illustrations: Sieb., Jaarb. Konink. Nederl. Maatschap. Aarmoed. Tuinb. 1845: pl. 6. 1845.

This variety differs from the typical form of the species in

having its fruits, young branchlets, and petioles purpurascens and the leaf-blades narrower and cuspidate at the apex.

Siebold's original (1845) description in Dutch and in Latin is "Met purpurrede bessen jonge takken en bladstelen, met smallere fijnpuntige bladen (baccis ramulis junioribus petiolisque purpurascens, foliis angustioribus cuspidatis)". Rehder (1949) reduces it to synonymy under typical C. japonica Thunb.

It is known to me only from the original description.

CALLICARPA JAPONICA var. GLABRA Nakai, Journ. Jap. Bot. 14: 640--641. 1938.

Bibliography: Nakai, Journ. Jap. Bot. 14: 640--641. 1938; Moldenke, Résumé Suppl. 15: 11. 1967.

This variety differs from the typical form of the species in having shiny branches, the leaf-blades elliptic or rhomboid-elliptic to oblong, crenulate-serrulate along the margins, completely glabrous or sparsely and minutely papillose along the midrib above and resinous-punctulate on both surfaces, and the inflorescences glabrous.

The type of the variety was collected by Takanoshin Nakai (no. 1344) in woods at Tyôzankan, province of Kôkai, Korea. Nakai records the common name "teriha-murasakisikibu" for it.

The taxon is known to me only from the literature. The C. japonica f. glabra P'ei is apparently synonymous with typical C. japonica Thunb., and it may very well be that Nakai's variety belongs there, too.

CALLICARPA JAPONICA f. GROSSIDENTATA Nakai, Journ. Jap. Bot. 14: 640. 1938.

Synonymy: Callicarpa japonica f. rhomb. grossident. Miq., Cat. Mus. Bot. Lugd.-Bat. 70, nom. nud. 1870. Callicarpa japonica f. grossidentata Miq. ex Moldenke, Résumé 243, in syn. 1959.

Bibliography: Miq., Cat. Mus. Bot. Lugd.-Bat. 70. 1870; Nakai, Bot. Mag. Tokyo 40: 492. 1926; Nakai, Journ. Jap. Bot. 14: 640. 1938; Hara, Enum. Sperm. Jap. 1: 183. 1948; Moldenke, Résumé 243. 1959; Moldenke, Résumé Suppl. 15: 11 & 17. 1967.

This form differs from the typical form of the species in having the leaves of flowering branches with their blades rhombic or elliptic, caudate-attenuate at the apex, and coarsely and acutely or irregularly subsinuate-dentate along the margins.

Nakai designated no type, but based the taxon on the five following specimens: (1) Nakai 13413, collected in pine woods at Tyôzankan, province of Kôkai, Korea, on August 4, 1929, (2) Nakai 8161, collected in rocky places at Kaigarmen in the Tatuzyô region, province of Keihoku, Korea, on July 8, 1919, (3) Nakai s.n., collected on Mt. Tiisan, province of Zennan, Korea, on June 29, 1913, (4) Isidoya & Tei-Daigan 3688, collected on Mt. Mongansan, on Daikokuzantô Island, province of Zennan, Korea, on August 25, 1919, and (5) Nakai 12071, collected at Siyôri, on Kaitô Island, province of Zennan, Korea, on May 22, 1928 -- the last two local-

ities being in the Korean Coastal Islands. Nakai records the vernacular name "nokome-murasakisikibu". The Hara (1948) reference in the bibliography is sometimes incorrectly cited as "p. 184".

Miquel (1870) cites Siebold 7 [specimens?] and Bürger 1 [specimen?] for this form. It is known to me only from the literature.

CALLICARPA JAPONICA f. *KIIRUNINSULARIS* Masam., Trans. Nat. Hist. Soc. Formos. 30: 63-64. 1940.

Synonymy: *Callicarpa japonica* var. *luxurians* Masam., Suzuki, & Mori apud Masam., Trans. Nat. Hist. Soc. Formos. 30: 64, in syn. 1940 [not *C. japonica* var. *luxurians* Rehd., 1916]. *Callicarpa japonica* f. *kuruninsularis* Masam. ex Li, Woody Fl. Taiwan 822 & 944, sphalm. 1963.

Bibliography: Masam., Suzuki, & Mori, Trans. Nat. Hist. Soc. Formos. 24: 411. 1934; Masam., Trans. Nat. Hist. Soc. Formos. 30: 63-64. 1940; Woody Fl. Taiwan 822 & 944. 1963; Moldenke, Résumé Suppl. 8: 3. 1964; Moldenke, Phytologia 15: 31. 1967.

This form differs from the typical form of the species in having its leaf-blades coriaceous-chartaceous, ovate-lanceolate, about 5 cm. long and 2 cm. wide, acuminate at the apex, and acuminate-cuneate at the base.

The type of the form was collected by Genkei Masamune, Sigetaka Suzuki, and Mosamu Mori (no. 106) at Kiirun-to, Kiirun, Taihoku-syū, Formosa, on July 15, 1934, and is deposited in the herbarium of the University of Tokyo. The vernacular name, "kiirun-murasakisikibu", is recorded for it by Masamune.

The taxon is known to me only from the literature.

CALLICARPA JAPONICA var. *LUXURIANS* Rehd. in C. S. Sarg., Fl. Wils.

3: 369. 1916 [not *C. japonica* var. *luxurians* Masam., Suzuki, & Mori, 1934].

Synonymy: *Premna staminea* Maxim., Bull. Acad. Imp. Sci. St. Pétersb. 31: 80. 1886. *Callicarpa japonica* f. *latifolia* Miq., Cat. Mus. Bot. Lugd.-Bat. 70, nom. nud. 1870. *Callicarpa japonica* f. *rugosior* Miq., Cat. Mus. Bot. Lugd.-Bat. 70, nom. nud. 1870. *Callicarpa kotoensis* Hayata, Journ. Coll. Sci. Imp. Univ. Tokyo 30 (1): [Mat. Fl. Formos.] 219. 1911. *Callicarpa shikokiana* Nakai, Fl. Sylv. Korean. 14: 31, in syn. 1923 [not *C. shikokiana* Mak., 1892]. *Callicarpa japonica* Matsumura ex Nakai, Fl. Sylv. Korean. 14: 31, in syn. 1923 [not *C. japonica* Hort., 1866 & 1936, nor L. f., 1966, nor Thunb., 1784, nor "Thunb. auct.", 1838]. *Callicarpa japonica* Miq. apud Nakai, Trees & Shrubs Indig. Jap., ed. 2, 1: 455, in syn. 1927. *Callicarpa kotoensis* Hayata apud Stapf, Ind. Lond. 1: 526. 1929. *Callicarpa japonica* var. *kotoensis* (Hayata) Masamune, Trans. Nat. Hist. Soc. Formos. 30: 63. 1940. *Callicarpa japonica* subsp. *luxurians* (Rehd.) Masamune & Yanagihara, Trans. Nat. Hist. Soc. Formos. 31: 323. 1941. *Callicarpa japonica* subsp. *luxurians* (Rehd.) Masamune ex Moldenke, Ré-

sumé 244, in syn. 1959. Callicarpa longifolia "sensu Li" ex Hatusuma, Mem. Fac. Agr. Kagoshima Univ. 5 (3): 47, in syn. 1966 [not C. longifolia Auct., 1965, nor Benth., 1966, nor Blume, 1936, nor Diels, 1916, nor Hance, 1932, nor Hemsl., 1916, nor Hook., 1932, nor L., 1820, nor Lam., 1783, nor Roxb., 1827, nor Vahl, 1936, nor "sensu Hemsl.", 1949, nor "sensu Mori", 1962].

Bibliography: Miq., Cat. Mus. Bot. Lugd.-Bat. 70. 1870; Maxim., Bull. Acad. Imp. Sci. St. Pétersb. 31: 80. 1886; J. Matsumura, Bot. Mag. Tokyo 13: 115. 1889; Hayata, Journ. Coll. Sci. Imp. Univ. Tokyo 30 (1): [Mat. Fl. Formos.] 219. 1911; Hayata, Icon. Pl. Formos. 2: 125, pl. 35. 1912; J. Matsumura, Ind. Pl. Jap. 2 (2): 529. 1912; Nakai, Veg. Isl. Quelp. 76. 1914; Rehd. in C. S. Sarg., Pl. Wils. 3: 369. 1916; Prain, Ind. Kew. Suppl. 5, pr. 1, 43. 1921; Nakai, Fl. Sylv. Korean. 14: 31 & 133, pl. 8. 1923; Nakai in Nakai & Koidz., Trees & Shrubs Indig. Jap., ed. 2, 454—455, fig. 215. 1927; T. Itô, Taiwan Shokubutsu [Illustr. Formos. Pl.] 7, pl. 604. 1927; S. Sasaki, List Pl. Formos. 350. 1928; Stapf, Ind. Lond. 1: 526. 1929; Masam. & Suzuki, Ann. Rep. Taih. Bot. Gard. 3: 66. 1933; Masam., Fl. & Geo. Yakus. 387. 1934; Kanehira, Formos. Trees, ed. 2, 644, fig. 600. 1936; K. Mori in Masam., Short Fl. Formos. 179. 1936; Nakai in Shirasawa, Icon. Essenc. Forest. Jap. 2: fig. 2481. 1938; Masam., Trans. Nat. Hist. Soc. Formos. 30: 63—64. 1940; Masam. & Yanagihara, Trans. Nat. Hist. Soc. Formos. 31: 323. 1941; Worsdell, Ind. Lond. Suppl. 1: 160. 1941; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 57, 58, 61, & 87. 1942; Hara, Enum. Sperm. Jap. 1: 184. 1948; Moldenke, Castanea 13: 121. 1948; Moldenke, Alph. List Cit. 2: 602. 1948; Hatusima, Journ. Jap. Bot. 24: 81. 1949; Moldenke, Alph. List Cit. 4: 1104. 1949; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 133, 140, 157, & 177. 1949; Moldenke, Phytologia 3: 139 (1949), 3: 380 (1950), 3: 462 (1951), and 5: 28, 100, & 101. 1954; Moldenke, Journ. Calif. Hort. Soc. 15: 86. 1954; Mizushima, Misc. Rep. Research Inst. Nat. Res. 38: 123. 1955; Mizushima & Mori, Misc. Rep. Research Inst. Nat. Res. 48: 77. 1958; Moldenke, Résumé 171, 172, 181, 213, 244, & 444. 1959; Moldenke, Résumé Suppl. 1: 13. 1959; Prain, Ind. Kew. Suppl. 5, pr. 2, 43. 1960; Moldenke, Résumé Suppl. 3: 18—21 (1962) and 4: 8. 1962; Hatusima, Mem. South. Indust. Sci. Inst. Kagoshima Univ. 3 (1): 31. 1962; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1206, pl. 1014. 1962; Li, Woody Fl. Taiwan 821. 1963; Ohwi, Fl. Jap. 764. 1965; Hatusima, Mem. Fac. Agr. Kagoshima Univ. 5 (3): 47. 1966; Moldenke, Résumé Suppl. 14: 4 & 7. 1966; Moldenke, Phytologia 14: 43, 59, & 156 (1966), 14: 254 & 256 (1967), and 15: 30—32 & 39. 1967; Moldenke, Résumé Suppl. 15: 17. 1967.

Illustrations: Hayata, Icon. Pl. Formos. 2: pl. 35. 1912; Nakai, Fl. Sylv. Korean. 14: pl. 8. 1923; T. Itô, Taiwan Shokubutsu Dzusetsu [Illustr. Formos. Pl.] pl. 604. 1927; Nakai, Trees & Shrubs Indig. Jap., ed. 2, 454, fig. 215. 1927; Kanehira, Formos. Trees, ed. 2, fig. 600. 1936; Nakai in Shirasawa, Icon. Essenc. Forest. Jap. 2: fig. 2481. 1938; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: pl. 1014. 1962.

This variety differs from the typical form of the species in having the branches robust, the leaves larger, thicker, and rather lustrous above, their petioles to 3 cm. long and their blades ovate-elliptic or ovate, 10--20 cm. long and 4--10 cm. wide, serrulate along the margins, the inflorescence broad, the cymes larger and with thicker branches, the corolla including the lobes 4--5 mm. long, the anthers 2.5 mm. long, and the fruit 5--6 mm. in diameter.

The type of this variety was collected by Père Emile Joseph Taquet (no. 4092) "in insula Septium", Quelpart Island, Korean Coastal Islands, on July 31, 1910, and is deposited in the herbarium of the Arnold Arboretum at Cambridge, Massachusetts. Rehder's original description is "A type recedit ramulis plus minusve pallide lenticellatis, foliis majoribus ovate-ellipticis v. ovatis acuminatis basi late cuneatis v. e basi rotundata sub-ito in petiolum productis dentatis dentibus triangularibus v. latissime triangularibus 10--18 cm. longis et 4.5--10 cm. latis, petiolis 1--2.5 cm. longis, pedunculis petiolis paullo brevioribus.....This variety with large membranous leaves up to 18 cm. long is apparently only a luxuriant form owing its origin to the moist subtropical climate of the islands where it grows." He cites, in addition to the type, Taquet 912, 3083, & 4097 from Quelpart, Faurie 4047 from Oshima, and C. Wright s.n. from Kiu-shiu.

Collectors describe this plant as a weak, slender, or scandent shrub, or erect, a subshrub, or a small tree, 1.5--4 m. tall, the stem 1.5 inches in diameter at breast height; the leaves membranous or leathery, slightly glossy or deep-green and glossy above, yellowish-green and opaque beneath, the flowers fragrant, and the fruit globose, glossy, purple or "beautiful purple" to violet or deep-violet. The corolla is described as "whitish" on F. R. Fosberg 38067, "lilac" on F. R. Fosberg 38298, "lavender" on F. R. Fosberg 37857 & 37869, Walker, Sonohara, Tawada, & Amano 6993, and Walker & Tawada 6511, "pale-lavender" on F. R. Fosberg 37066, "pale purple-violet" on Matsuki 172, and "yellow" on Conover 1019. Matsuki reports that the young leaves may be eaten.

The variety has been found growing in thickets in ravines, woods, forests, thicket margins, the edge of shrine forests, on rough limestone in lowland thickets, steep slopes above the sea, seashore cliffs, and clay soil with coarse grass and shrubs, at the inner edge or back of beaches, among scrub on beach ridges; and local on large limestone boulders or remnants in scattered grasslands, at altitudes of sea-level to 50 meters, flowering from May to August and October, fruiting in March, July, October, and November. Kobayashi refers to it as "common" on Oshima and Matsuki calls it "common" on Honshiu, but Fosberg reports that it is only "occasional" on Ishigaki and Miyako. Mizushima (1955) avers that it is "Uncommon in and on the margins of forests". Nakai (1923) gives its general distribution as Quelpart, Dagelet, Ryukiu Islands, Kiu-shiu, Shikoku, and Honshiu. Ohwi (1965) tells us that in Japan it inhabits "Lowlands near the sea; Honshu, Shi-

koku, Kyushu; rather common". Mizushima & Mori (1958) say that "A form approaching var. luxurians Rehd. is often found near sea-shores" on the Shimokita Peninsula in Aomori Prefecture.

Vernacular names recorded for the variety are "bigleaf Japanese beautyberry", "do-murasakishikibu", "koto-murasakisikibu", "kôtsô-murasaki", "murasakishikibu", "murasaki-shikinu", "omurasakishikibu", "o-murasakishikibu", "ô-murasakishikibu", and "ô-murasaki-shikibu".

The original description of Premna staminea (1886) is as follows: "Innovans tomento stellato incana cito glabrata, foliis membranaceis ellipticis v. oblongo-ellipticis utrinque attenuatis basi sensim in petiolum brevem, versus apicem argute serrulatis, cyma composita plana laxa, pedicellis calyce glabro truncato 4-nervi longioribus, corollae extus tomentellae intus glabrae calycem 3--10 superantis tubo late subturbinato limbum patulum 4-lobum subsuperante lobis rotundatis 2 superioribus majoribus tenuioribus, staminibus aequalibus basi tubi insertis corollam subduplo excedentibus, antheris amplis oblongis punctis aureo-glandulosis adpersis, stylo tenui longiore stigmatis lobis 2 rotundatis conniventibus, ovario 2-loculari. Liukiu (Tanaka flor). Antherae forma et corollae lobis subaequalibus inter omnes notas excellens et anomala. Ramus ante oculos cortice laeviusculo albidoochraceo. Folia maxima petiolo 7 mm., lamina 100: 45 mm. concolore utrinque subquinquecostata costis arcuatis reticuloque distincto subtus vix prominulis sed obscurioribus, folia minora petiolo 5 mm., lamina 50: 20--25 mm. Calyx 2 mm. latus et longus. Corolla 9 mm., genitalia exserta totidem."

Nakai (1923), Hara (1948), and Ohwi (1965) reduce C. australis Koidz. to synonymy under C. japonica var. luxurians, and this disposition may very well prove to be correct. On the other hand, Liu (1962) reduces C. antaensis Hayata to synonymy here, but I regard it as C. longifolia Lam. Hatusima (1966) reduces C. kotoensis Hayata, C. japonica var. kotoensis (Hayata) Masamune, and C. longifolia "sensu Li" to synonymy under C. denticulata Merr., but with this disposition of these names I cannot agree!

Li (1963) reduces C. kotoensis Hayata and C. japonica var. kotoensis (Hayata) Masamune to synonymy under C. longifolia Lam. He notes "Hayata says of his C. kotoensis as 'near C. pilocalyx Clark and C. longifolia Lamk., but differs from both by the larger flowers and less hairy leaves'. When compared with large series of C. longifolia specimens from all over tropical Asia, the Lanyu plant cannot be specifically separated." He cites from Lanyu Island: Kawakami & Sasaki 37 & 38, Miyake s.n., and Takano s.n.

The C. longifolia credited to Blume and to Vahl in the synonymy above is a synonym of the valid species, C. longifolia Lam., that credited to "Auct.", to Linnaeus, and to Roxburgh is C. longifolia f. floccosa Schau., that credited to Bentham, to Hance, and to "sensu Mori" is C. longissima (Hemsl.) Merr., that credited to

Hooker is C. brevipes (Benth.) Hance, that credited to Diels is C. bodinieri var. giraldii (Hesse) Rehd., that credited to "sensu Hemsl." is C. japonica var. angustata Rehd., while that credited to Hemsley is in part C. bodinieri var. giraldii and in part C. japonica var. angustata. The Maximowicz reference (1886) cited above is sometimes erroneously cited "32: 80. 1887".

Nakai (1923) says of var. luxurians "Hab. in Quelpaert et Dag-elet. Distr. Liukiu, Kiusiu, Shikoku et Hondo". Hatusima (1949) records it from the Daito Islands and cites Kawagoe s.n. from Daito Island and from Iriomote Island.

Masamune (1940) cites the following specimens: KIZAN ISLAND [Formosa]: Masamune & Suzuki s.n. [Taihoku-syu, VII.3.1932]. OKINAWAN ISLANDS: Iheyashima: Suzuki 2530. AMAMI ISLANDS: Amami-shima: Ohba 90. SAKOSHIMA ISLANDS: Iriomote: Masamune 2527. Miyazakiken: Matuda 2819. Masamune also cites Hosokaya 8053 from Koto-syo Island, deposited in the Tokyo University herbarium.

Material has been misidentified and distributed in herbaria as typical C. japonica Thunb. On the other hand, the Sawada s.n. [Province of Sagami], distributed as var. luxurians, is actually C. bodinieri var. giraldii (Hesse) Rehd., Hurusawa 14-I is C. japonica Thunb., and E. H. Wilson 9543 is C. japonica var. rhombifolia H. J. Lam.

For his f. rugosior Miquel (1870) cites Bürger 3 [specimens?] and Siebold 1 [specimen?] and for his f. latifolia he cites only Siebold 1 [specimen?].

In all, 63 herbarium specimens and 5 mounted photographs have been examined by me.

Citations: CHINA: Kiangsi: Ip s.n. [Herb. Univ. Nanking 1402] (Io--144021). KOREA: In-Cho 1095 (Mi), 1097 (Mi), 3364 (Mi), 3466 (Mi); In-Cho's Collector 9516 (Mi); Yongsok 7931 (Mi), 8098 (Mi, Mi). KOREAN COASTAL ISLANDS: Botel Tobago: Kanehira s.n. [June 5, 1919] (N--photo, Ph, Z--photo). Koto-syo: Hosokawa 8053 (Bi); Kanehira & Sasaki s.n. [5.VIII.1919; Herb. Nat. Taiwan 20989] (W--photo). Quelpart: In-Cho 1099 (Mi, Mi), 1100 (Mi); Yongsok 8730 (Mi), 8752 (Mi). Ullong: Yongsok 2415 (Mi), 2560 (Mi), 5957 (Mi), 5961 (Mi), 6303 (Mi). WESTERN PACIFIC ISLANDS: JAPAN: Enoshima: Sawada s.n. [12 Jun. 1927] (S, S). Hokkaido: Maximowicz s.n. [Hakodate, 1861] (C, S, W--9066). Honshu: Natusuki 172 (W--2337826); J. Matsumura s.n. [Tokio, June 29, 1879] (W--147601); Y. Matsumura 3349 (N); Mizushima 14-1-A (W--2037867); Numata 36 (Ws). Kiushiu: Masamune s.n. [prov. Osumi, Aug. 30, 1927] (N); C. Wright s.n. [Kiusiu] (W--9970). Oshima: Kobayashi 15073 (S); Miyabi & Tokubuchi s.n. [prov. Oshima, July 17, 1890] (N). Island undetermined: Dahlstrand s.n. [Mine, 22/11/1954] (Go); Herb. Lugd.-Batav. s.n. [Japonia] (S); Herb. Mus. St. Petersburg s.n. (W--9965); Oldham 621 (T). RYUKYU ISLAND ARCHIPELAGO: SATSU-

NAN ISLANDS: Takeshima: Tagawa & Motozi 1817 (Ws). OKINAWAN ISLANDS: Okinawa: Amano 6034 (N, W—2036164), 6360 (W—2070886), 6941 (W—2070927); Conover 1019 (W—1993147), 1035 (W—1993150); Kawagoe s.n. [Aug. 8, 1913] (W—2071332); R. Moran 5076 (Ca—78428); Walker, Sonohara, Tawada, & Amano 6993 (N); Walker, Tawada, & Amano 5820 (N). SAKISHIMA ISLANDS: Iriomote: F. R. Fosberg 37763 (Sm); Murayama s.n. [Aino 1927] (W—2071199); Walker & Tawada 6511 (W—2093799). Ishigaki: F. R. Fosberg 37066 (Sm), 37857 (Sm), 37869 (Z), 38067 (Sm). Miyako: F. R. Fosberg 38298 (Sm). NANPO ISLANDS: Aogashima: Mizushima 2641 (s). Hachijo: Suzuki 24 [Herb. Suzuki 391072] (Ca—793437), 217 [Herb. Suzuki 391072] (W—1994837). CULTIVATED: California: Walther s.n. [Bard's place, June 16, 1921] (Gg—31981). Germany: Herb. Mus. Bot. Berol. s.n. [hort. bot. Berol. 14.X.20] (B).

CALLICARPA JAPONICA f. MAJOR Nakai, Journ. Jap. Bot. 14: 639—640. 1938.

Bibliography: Nakai, Journ. Jap. Bot. 14: 639—640. 1938; Moldenke, Résumé Suppl. 15: 11. 1967.

This form differs from the typical form of the species in having the branches more slender, the leaf-blades papyraceous, those of the flowering branches oblong or obovate, 10—12.5 cm. long, 4.5—6 cm. wide, cuneate or obtuse at the base, rather obtusely cuspidate or subcaudate at the apex with the cusp entire, those of the lateral branchlets shorter than in the typical form, the inflorescence abbreviated and congested. In the form of the leaf it resembles var. luxurians Rehd., but the branches are more slender, the leaf-blades papery, and the inflorescence shorter.

The cotypes of this form were collected by Takanoshin Nakai on the island of Taiseitō, Korean Coastal Islands — no. 13409 in the province of Kōkai on July 26, 1929, and no. 12069 on Mt. Hakuyōzan, in the Tyōzyō region, province of Zenman, on June 4, 1928. A vernacular name recorded for the plant is "usubamurasakisikibu". The taxon is known to me only from the literature.

CALLICARPA JAPONICA var. MICROCARPA Nakai, Bot. Mag. Tokyo 40: 492. 1926.

Bibliography: Nakai, Bot. Mag. Tokyo 40: 492. 1926; Hara, E-mm. Spem. Jap. 1: 184. 1948; Moldenke, Phytologia 3: 295. 1950; Moldenke, Résumé 172 & 444. 1959.

This variety differs from the typical form of the species in having the leaf-blades obovate, 8—12 cm. long, 2.5—4.5 cm. wide, long-caudate-attenuate at the apex, obscurely serrate along the margins, cuneate-attenuate at the base, and the fruits small, purple, 1.5—2.5 mm. wide.

The type of the variety was collected by Takanoshin Nakai in the province of Shimotsuke, Honshiu, Japan, without number, and is deposited in the herbarium of the University of Tokyo.

The taxon is known to me only from the literature.

CALLICARPA JAPONICA var. *RHOMBIFOLIA* H. J. Lam, Verbenac. Malay. Arch. 85. 1919.

Synonymy: *Callicarpa rhynchophylla* Miq., Fl. Ind. Bat. 2: 888. 1856. *Callicarpa japonica* f. *rhombifolia* Miq. ex Nakai, Journ. Jap. Bot. 14: 640. 1938.

Bibliography: Miq., Fl. Ind. Bat. 2: 888. 1856; Miq., Ann. Mus. Bot. Lugd.-Bat. 2: 98. 1865; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 386. 1893; H. J. Lam, Verbenac. Malay. Arch. 85. 1919; Bakh. in Lam & Bakh., Journ. Jard. Bot. Buitenz., ser. 3, 3: 26. 1921; Nakai, Journ. Jap. Bot. 14: 640 & 641. 1938; Moldenke, Prelim. Alph. List Invalid Names 12. 1940; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 65 & 87. 1942; Moldenke, Alph. List Invalid Names 10. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 386. 1946; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 146 & 177. 1949; Moldenke, Phytologia 4: 75, 82, & 88. 1952; Moldenke, Résumé 172, 193, 213, 246, 427, & 444. 1959; Moldenke, Résumé Suppl. 1: 12. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 386. 1960; Moldenke, Résumé Suppl. 13: 5 (1966) and 14: 3. 1966; Moldenke, Phytologia 14: 59 & 167 (1966), 14: 254 (1967), and 15: 28 & 32. 1967; Moldenke, Résumé Suppl. 15: 17. 1967.

This variety differs from the typical form of the species in having the leaves on its flowering branches short-petiolate, dilated, obtusely rhombic or broadly elliptic, and equally serrate along the margins.

The type of the variety was collected by Pieter Willem Korthals somewhere in Borneo and is deposited in the Rijksherbarium at Leiden as sheet number 908.263—29. The type of *C. rhynchophylla* is apparently the same unnumbered Korthals collection, but the specimen is deposited in the herbarium of the Botanisch Museum at Utrecht as sheet number 049890. *Callicarpa japonica* f. *rhombifolia* is based on three collections: (1) Nakai 13411 from pine woods at Tyôzankan, in the province of Kôkai, Korea, collected on August 4, 1929, (2) R. K. Smith 442 from Mt. Tyôzyusan, in the same province, collected in 1930, and (3) Nakai 12072 bis from Mugisima Island, in the province of Keinan, collected on May 4, 1928.

Miquel (1856) describes his *C. rhynchophylla* as follows: "Innovationes stellato-tomentoso-albidae, adulta fructuifera undique fere glabra, ramuli tenues, folia brevissime petiolata e basi magis minusve cuneata integerrima lato- vulgo rhombico-elliptica acute grossiuscule concinne dentato-serrata, in acumen longum lineari-lanceolatum acutum integerrimum abrupte terminata, 4 1/2 — 2 1/2 poll. longa, chartacea, adultiora supra in nervis pube brevissima scabriuscula adspersa, subtus glabra glandulis luteis crebro punctata, costulis venosis teneris parallelis notata, cymae axillares brevi-pedunculatae breves subdensiflorae, calyx cupularis brevissime 4-callosomucronulatus, drupae (immaturae) obovoidae."

Lam (1919) describes the variety as follows: "folia latiora, rhomboidea, basi late cuneata, margine usque ad dimidium folii integra, ceterum praeter acumen grosse serrato-dentata, apice abrupte

acuminata, acumine 2 cm. longo, integro, obtusiusculo, nervis secundariis utrinque 7—9; 4—9 cm. longa, 5 1/2 cm. lata; petiolo 0.2—0.3 cm.; cymis trichotomis, pedunculo gracili, 0.7 cm. longo.. Probably the form with 'wider leaves, less acute base, often rhomboid, and with 9 nerves on each side of the midrib' is identical with our var. ♀, which is also Miquel's C. rhynchophylla."

Collectors describe this plant as a bush or small shrub, 3—15 feet tall, branching irregularly, the crown 25 feet in circumference, and the fruit deep-pink or purple. It has been found growing on rocky slopes, along roadsides, in flats of streambeds, and in full sun on hillsides near the sea, at altitudes of near sea-level to 660 meters, flowering from June to August, fruiting in March, August, October, and November. The corolla is described as "white" on Chiao 2617 and as "purple" on J. F. C. Rock 9195 and E. H. Wilson 10411. Wilson refers to the plant as "common in thickets" and as "not common near waterfalls" in Korea. Vernacular names reported for it are "maruba-murasakisikibu" and "murasaki shikibu". The specimens cited below as Herb. Hort. Tjibodasensis J.20 [and probably the other numbers from this garden] were taken from plants grown from seeds originally obtained from Japan.

The printed label on E. H. Wilson 9262 says "Japan", but my friend and colleague, Dr. Tetsuo Koyama, assures me that the locality given on the label as the actual place of collection is in Korea, not Japan.

Bakhuizen van den Brink (1921) places C. rhynchophylla in the synonymy of C. longifolia Lam., a disposition which I cannot follow.

Material has been misidentified and distributed in herbaria under the names C. dichotoma (Lour.) K. Koch, C. giraldiana Hesse, C. japonica Thunb., C. mollis Sieb. & Zucc., C. zollingeriana Schau., "Callicarpa var. luxurians Rehd.", and Caryopteris sp.

In all, 34 herbarium specimens, including type material of all the names involved, and 2 mounted photographs have been examined by me.

Citations: CHINA: Hupeh: E. H. Wilson 439 [6/07] (W—777043), 439 [10/07] (W—777043). Shantung: Chiao 2617 (B, Ca—480124, Gg—193269, N, N, S, W—1553781, W—1575913); Zimmermann 210, in part (S, W—795356). Yunnan: J. F. C. Rock 9195 (Ca—327974, W—1332124). KOREA: Mrs. R. K. Smith s.n. [8-10-1937] (W—1756660), s.n. [8-20-1938] (W—1756661); E. H. Wilson 9262 (W—1054181, W—1054182), 9543 (W—1054202), 10411 (W—1052226); Yongsok 9049 (Mi). WESTERN PACIFIC ISLANDS: JAPAN: Honshiu: Takeuchi 11 (W—2073698). Jesso: Albrecht s.n. [1861] (C). RYUKYU ISLAND ARCHIPELAGO: OKINAWAN ISLANDS: Okinawa: Conover 1140 (Bi); Field & Loew 21w (Ca—745252, Mi, W—1942625). INDONESIA: GREATER SUNDA ISLANDS: Borneo: Korthals s.n. (N—photo of isotype, Ut—49890— isotype, Z—photo of isotype). CULTIVATED: France: Herb. Hort. Huber 735 (M). Java: Herb. Hort. Tjibodensis J.20 (Bz—17647,

Bz—26486), P (Bz—26487), Q (Bz—26488, Bz—26489).

CALLICARPA JAPONICA var. *TAQUETII* (Léveillé) Nakai, Trees & Shrubs Japan, ed. 1, 336. 1922.

Synonymy: *Callicarpa taquetii* Léveillé in Fedde, Repert. Spec. Nov. 12: 182. 1913. *Callicarpa japonica* var. *taquetii* Nakai, Fl. Sylv. Korean. 14: 31. 1923.

Bibliography: Léveillé in Fedde, Repert. Spec. Nov. 12: 182. 1913; Prain, Ind. Kew. Suppl. 5, pr. 1, 44. 1921; Nakai, Trees & Shrubs Indig. Jap., ed. 1, 336. 1922; Nakai, Fl. Sylv. Korean. 14: 31 & 133, pl. 7. 1923; Nakai, Trees & Shrubs Indig. Jap., ed. 2, 454. 1927; Rehd., Journ. Arnold Arb. 15: 324. 1934; Terazaki, Suppl. Illustr. Fl. Jap. fig. 2482. 1938; Worsdell, Ind. Lond. Suppl. 1: 160. 1941; Hara, Enum. Sperm. Jap. 1: 184. 1948; Rehd., Bibl. Cult. Trees 583. 1949; Moldenke, Phytologia 3: 380. 1950; Moldenke, Résumé 171, 244, 247, & 444. 1959; Prain, Ind. Kew. Suppl. 5, pr. 2, 44. 1960; Moldenke, Phytologia 14: 162 & 167 (1966) and 14: 254. 1967.

Illustrations: Nakai, Fl. Sylv. Korean. 14: pl. 7. 1923; Terazaki, Suppl. Illustr. Fl. Jap. fig. 2482. 1938.

This variety differs from the typical form of the species in having slender branches, smaller leaves, and fewer-flowered inflorescences.

Rehder (1934 & 1949) reduces this taxon to synonymy under *C. dichotoma* (Lour.) K. Koch, and this may very possibly be correct. I have seen no authentic material of it as yet and therefore hesitate to reduce it. Nakai (1923) records it from Quelpart Island, central Korea, and western Hondo. He notes that "Planta majora sensim in typicam transit". In his 1927 work he cites *C. taquetii* to page "192" in error. Vernacular names recorded for the plant are "koba-murasakishikibu" and "koba-murasishikibu". The *In-Cho* 1104, distributed as this variety, is actually typical *C. dichotoma* (Lour.) K. Koch.

The taxon is known to me thus far only from the literature.

CALLICARPA KINABALUENSIS Bakh. & Heine ex Heine in Fedde, Repert. Spec. Nov. 54: 246. 1951.

Synonymy: *Callicarpa kinabaluensis* Bakh. ex Moldenke, Phytologia 4: 42—43. 1952. *Callicarpa kinabakuensis* Bakh. ex Moldenke, Résumé 244, in syn. 1959. *Callicarpa kinabaluensis* Bakh. ex Moldenke, Résumé 244, in syn. 1959. *Callicarpa kinabaluensis* Bakh. & Heine ex Moldenke, Résumé 444. 1959.

Bibliography: Heine in Fedde, Repert. Spec. Nov. 54: 246. 1951; Moldenke, Phytologia 3: 463 (1951) and 4: 42—43, 81, 82, 123, & 127, 1952; Moldenke, Biol. Abstr. 26: 1471. 1952; Heine, Mitteil. Bot. Staatssamml. München 6: 225. 1953; Moldenke, Résumé 192, 244, & 444. 1959.

Small tree or shrub, about 1 m. tall; stems and branches very heavy and coarse, obtusely tetragonal, very medullose, very densely hirsute or hirsute-strigose with pale-cinnamon or ferruginous-

fulvous hairs about 5 mm. long standing at right angles to the stem, more matted and finally even glabrescent toward the base of the plant in age; branchlets very densely pale-cinnamon hirsute-strigose with hairs 3--4 mm. long; principal internodes 3--8 cm. long; nodes annulate; leaves large, decussate-opposite; petioles very stout, 2.5--3 cm. long, about 3 mm. thick, very densely spreading-hirsute or pale-cinnamon hirsute-strigose like the branches, slightly canaliculate beneath; leaf-blades thick-textured, firmly chartaceous or subcoriaceous, elliptic or oblong-elliptic to obovate, 15--30 cm. long, 7.5--11 cm. wide, acute or acuminate at the apex, dentate from near the base to just below the terminal acumination, or very slightly serrate and dentate above the middle, slightly cuneate or rounded at the base, rather densely villous-pubescent above, less so in age, very densely matted-tomentose beneath with ferruginous-fulvous hairs, or only the vein and veinlet reticulation very densely cinnamon-ochraceous tomentose-hirsute above and especially the vein and veinlet reticulation densely stellate beneath, the intervenous spaces very minutely yellow glandular-punctate; midrib very stout, flat above, very densely tomentose on both surfaces, very prominent beneath; secondaries slender, 7--12 per side, flat or slightly prominent above, prominent beneath, arcuate-ascending, running to the margins but not anastomosing; veinlet reticulation quite abundant, obscure above, prominent beneath, normally hidden by the dense tomentum; inflorescence axillary, 2-per node, somewhat recurved, cymose, 5--7 cm. long, much shorter than the subtending leaf, 4--6.5 cm. wide, composed normally of 2 lateral widely divergent branches and no terminal one, the branches stout, 1--1.5 cm. long, very densely ferruginous-hirsute like the stems, once or twice furcate, bearing 2--4 densely many-flowered subcapitate cymes, very densely pale-cinnamon hirsute-strigose throughout; peduncles stout, 3--4 cm. long, very densely ferruginous-villous like the stems; bractlets lanceolate or lanceolate-ovate, 8--10 mm. long, about 2 mm. wide, attenuate-acute at the apex, densely ferruginous-hirsute or hirsute-strigose with more or less appressed hairs; pedicels completely obscured by the dense villous hairs; flowers sessile at the apex of the inflorescence-branches, very densely glomerulate and only partly visible in the dense strigose tomentum of all parts of the inflorescence, often 6 glomerules per cyme, 15 flowers per glomerule; calyx campanulate, 3--5 mm. long, very densely hirsute with ferruginous many-celled erect hairs or villous with cinnamon-ochraceous hairs outside, glabrous inside, its rim deeply apiculate-lobed; corolla small, white or cream-colored; stamens yellow or lemon-yellow, about 1 mm. long; anthers cream; pistil white, about 1.5 mm. long.

The type of this species was collected by Joseph and Mary Knapp Clemens (no. 31348) at Penibukan, Mt. Kinabalu, at an altitude of 4000--5000 feet, British North Borneo [Sabah], on January 24, 1933, and is deposited in the Herbarium Bogoriense at Buitenzorg, Java. Unfortunately, not knowing of the 1951 valid publication of this binomial, I also published it, credited only to Bakhuizen van den Brink (as the binomial appears on the original

herbarium labels), in 1952 with a dieresis on the "e" and with Clemens & Clemens 33200 from Marai Parai, Mt. Kinabalu, May 22, 1933, as the type, also deposited at Buitenzorg. The earlier publication and typification, of course, are the only valid ones.

The corolla is described as "white" on Clemens & Clemens 31348, 31900, & 33200. Collectors have found the plant growing in open places, flowering in January, March, May, and December. Clemens & Clemens s.n. [Penibukan, Jan. 16, '33], a topotype collection, was distributed as C. "aff. C. roxburghii Wall. ex Walp. vel forma"

Heine (1951) makes the following comments about this plant: "Die hier erstmalig publizierte Art unterscheidet sich leicht von allen bisher bekannten Callicarpa-Arten durch die sehr dichte, zint- bis ocker-farbige, zottige Behaarung aller Teile. -- Die nächstverwandte Art dürfte in C. tomentosa WILLD. (Hongkong, Süd-China) zu erblicken sein, die sich aber von ihr durch eine mehr seidige, auf der Blattunterseite und in der Infloreszenz fast weiszgraue Behaarung und die nahezu kahle Blattoberseite und die viel spärlicher behaarte Blattunterseite unterscheidet. C. macrophylla VAHL (= C. roxburghii WALL. pp.) ist von der vorliegenden Art unterschieden: a) durch die schon bei C. tomentosa WILLD. aufgeführten Merkmale, b) durch die abweichende Blattform und den andersartigen, viel lockereren und reichverzweigteren Aufbau der Infloreszenz."

In all, 16 herbarium specimens, including type material of all the names involved, and 2 mounted photographs have been examined by me.

Citations: INDONESIA: GREATER SUNDA ISLANDS: Sabah: M. K. Clemens 11273 (Bz--17667, Ca--214827); Clemens & Clemens 31348 (Bz--17681--type, Ca--559534--isotype, N--isotype), 31900 (Bz--17663, Bz--17664), 33200 (Bz--17665, Bz--17666, Ca--557089, Mi, N, N--photo, Z--photo), s.n. [Penibukan, Jan. 16, 1933] (Bz--17682, Bz--17683, Ca--559535, N).

CALLICARPA KINABALUENSIS var. ENDERTI Moldenke, Phytologia 4: 125 & 127. 1952.

Synonymy: Callicarpa kinabaluënsis var. enderti Moldenke, Résumé 444. 1959.

Bibliography: Moldenke, Phytologia 4: 123, 125, & 127. 1952; Moldenke, Biol. Abstr. 27: 984. 1953; Moldenke, Résumé 193 & 444. 1959.

This variety differs from the typical form of the species in having the lower leaf-surface densely hirsutulous, but not matted-tomentose, the peduncles 1 cm. or less in length, and the cymes much more open, with the flowers and fruits distinctly pedicellate.

The type of the variety was collected by Frederik Hendrik Enderdt (no. 2913) -- in whose honor it was named -- at Long Temelen, northeastern Borneo, at 200 meters altitude, on August 26, 1925, and is deposited in the Herbarium Bogoriense at Buitenzorg, Java.

The collector describes the plant as a tree, and the corollas are said to have been "white" on Endert 2666. In all, 5 herbarium specimens, including the types of all the names involved, and 2 mounted photographs have been examined by me.

Citations: INDONESIA: GREATER SUNDA ISLANDS: Borneo: Endert 2543 (Bz--72711), 2666 (Bz--72710, N), 2913 (Bz--72571--type, N--photo of type, Z--photo of type), 3737 (Bz--72707).

CALLICARPA KINABALUENSIS var. TONSA Moldenke, Phytologia 4: 127. 1952.

Synonymy: Callicarpa kinabaluensis var. tonsa Moldenke, Résumé 444. 1959.

Bibliography: Moldenke, Phytologia 4: 123 & 127. 1952; Moldenke, Biol. Abstr. 27: 984. 1953; Moldenke, Résumé 193 & 444. 1959.

This variety differs from the typical form of the species in having the pubescence on its branches, branchlets, petioles, peduncles, and inflorescence-branches, as well as on both leaf-surfaces, merely fulvous-pubescent with rather short appressed or subappressed hairs, and the peduncles 1 cm. or less in length, more open, and loose.

The type of the variety was collected by Frederik Hendrik Endert (no. 4489) at Kemvel, at an altitude of 1800 meters, in north-eastern Borneo, on October 22, 1925, and is deposited in the Herbarium Bogoriense at Buitenzorg, Java.

In all, 2 herbarium specimens, including the types of all the names involved, and 2 mounted photographs have been examined by me.

Citations: INDONESIA: GREATER SUNDA ISLANDS: Borneo: Endert 4489 (Bz--72708--type, N--isotype, N--photo of type, Z--photo of type).

CALLICARPA KOCHIANA Mak., Bot. Mag. Tokyo 28: 181--182. 1914.

Synonymy: Callicarpa tomentosa Willd., Enum. Plant. Hort. Berol. 158. 1809 [not C. tomentosa Bakh., 1932, nor König, 1893, nor "L. ex Moldenke", 1959, nor "L. ex Spreng.", 1825, nor "L. ex Willd.", 1966, nor (L.) Murr., 1774, nor (L.) Santapau, 1965, nor Lam., 1783, nor Murr., 1893, nor Thunb., 1959, nor Vahl, 1794]. Callicarpa loureiri Hook. & Arn., Bot. Beech. Voy. 206, nom. provis. 1836; E. D. Merr., Trans. Am. Philos. Soc., new ser., 24 (2): [Comm. Lour.] 332--333. 1935. Callicarpa roxburghii Schau. apud Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26: 255, in syn. 1890 [not C. roxburghii Wall., 1829]. Callicarpa longiloba Merr., Philip. Journ. Sci. Bot. 13: 156. 1918. Callicarpa tomentosa Hook. & Arn. apud E. D. Merr., Philip. Journ. Sci. Bot. 13: 156, in syn. 1918. Callicarpa cinnamomea Nakai, Trees & Shrubs Indig. Jap., ed. 1, 340, in nota. 1922. Callicarpa longiloba L. ex Moldenke, Suppl. List Invalid Names 2, in syn. 1941. Callicarpa roxburghii H. J. Lam apud Hara, Enum. Sperm. Jap. 1: 184, in syn. 1948. Callicarpa roxburghii "sensu H. J. Lam" apud

Liu, *Illustr. Nat. & Introd. Lign. Pl. Taiwan* 2: 1208, in syn. 1962. *Callicarpa tomentosa* Auct. ex Moldenke, *Résumé Suppl.* 3: 30, in syn. 1962. *Callicarpa tomentosa* "sensu Matsum. & Hayata" apud Li, *Woody Fl. Taiwan* 819, in syn. 1963. *Callicarpa tomentosa* "sensu Matsum." ex Moldenke, *Résumé Suppl.* 8: 4, in syn. 1964. *Callicarpa tomentosa* "sensu auct. Japon." apud Ohwi, *Fl. Jap.*

764, in syn. 1965. *Callicarpa roxburghii* "Wall. ex Schau." apud Sprague & Fischer in E. D. Merr., *Trans. Am. Phil. Soc.* 24 (2): 333, in syn. 1935. *Callicarpa loureiroi* Hook. & Arn. apud Sprague & Fischer, in herb. *Callicarpa loureirii* Hook. & Arn., in herb.

Bibliography: Jacq., *Ind. Pl.*, ed. 14, 32. 1785; Lour., *Fl. Cochinch.*, ed. 1, 1: 70. 1790; Willd., *Enum. Plant. Hort. Berol.* 158. 1809; Roem. & Schult., *Linn. Syst. Veg.* 3: 96. 1818; Steud., *Nom. Bot.*, ed. 1, 137. 1821; Roth, *Nov. Pl. Spec.* 82. 1821; Hook., *Exot. Fl.* 2: pl. 133. 1825; Wall., *Numer. List* [50] (as "49"). 1829; Hook. & Arn., *Bot. Beech. Voy.* 205--206. 1836; Walp., *Repert. Bot. Syst.* 4: 127. 1845; Schau. in A. DC., *Prodr.* 11: 640 & 647. 1847; Walp., *Ann. Bot. Syst.* 3: 236--237. 1852; Champ. & Benth. in Hook., *Journ. Bot. & Kew Gard. Misc.* 5: 135. 1853; Benth., *Fl. Hongk.* 269. 1861; Bocq., *Adansonia* 2: 158 (1862) and 3: 192. 1863; Bocq., *Rev. Verbenac.* 158 & 192. 1863; Maxim., *Bull. Acad. Sci. St. Pétersb.* 31: 75. 1886; Maxim., *Mél. Biol.* 12: 504. 1886; Mak., *Bot. Mag. Tokyo* 2: [220]. 1888; Forbes & Hemsl., *Journ. Linn. Soc. Lond. Bot.* 26: 255. 1890; Kuntze, *Rev. Gen. Pl.* 2: 503. 1891; Mak., *Bot. Mag. Tokyo* 6: [181]. 1892; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, pr. 1, 1: 386. 1893; Briq. in Engl. & Prantl, *Nat. Pflanzenfam.* 4 (3a): 166. 1895; J. Matsum., *Bot. Mag. Tokyo* 13: 114. 1899; Matsum. & Hayata, *Journ. Coll. Sci. Univ. Tokyo* 22: [*Enum. Pl.*] 299. 1906; Kawakami, *List Pl. Formos.* 84. 1910; Dunn & Tutchet, *Kew Bull. Misc. Inf. Addit. Ser.* 10: [*Fl. Kwang. & Hongk.*] 202. 1912; J. Matsum., *Ind. Pl. Jap.* 2 (2): 530. 1912; Mak., *Bot. Mag. Tokyo* 28: 181--182. 1914; E. D. Merr., *Philip. Journ. Sci. Bot.* 13: 156. 1918; Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 10 & 22--23. 1921; Prain, *Ind. Kew. Suppl.* 5, pr. 1, 43. 1921; Nakai, *Trees & Shrubs Indig. Jap.*, ed. 1, 340. 1922; Nakai, *Bot. Mag. Tokyo* 38: 46. 1924; Chung, *Mem. Sci. Soc. China* 1 (1): 226. 1924; A. W. Hill, *Ind. Kew. Suppl.* 6: 34. 1926; T. Itô, *Taiwan Shokubutu Dzusetu* [*Illustr. Formos. Pl.*] 12, pl. 604 & 606. 1927; Nakai, *Trees & Shrubs Indig. Jap.*, ed. 2, 1: 458--459, fig. 218. 1927; S. Sasaki, *List Pl. Formos.* 350. 1928; P. Dop, *Bull. Soc. Hist. Nat. Toulouse* 64: 500--502, 511, & 512. 1932; P'ei, *Mem. Sci. Soc. China* 1 (3): 14 & 18--21. 1932; E. D. Merr., *Trans. Am. Philos. Soc.*, new ser., 24 (2): [*Comm. Lour.*] 332--333. 1935; P. Dop in Lecomte, *Fl. Gén. Indo-Chine* 4: 789. 1935; Kanehira, *Formos. Trees*, ed. 2, 645, fig. 601. 1936; Moldenke in Fedde, *Repert. Spec. Nov.* 39: 295 & 298 (1936) and 40: 116--117, 120, 123, & 125. 1936; Masamune, *Short Fl. Formos.* 180. 1936; Terazaki, *Suppl. Illustr. Fl. Jap.* fig. 2486. 1938; A. W. Hill, *Ind. Kew. Suppl.* 9: 46. 1938; Moldenke, *Alph. List Common Vern. Names* 4. 1939; Moldenke, *Geogr.*

Distrib. Avicenn. 36. 1939; Doi, Journ. Jap. Bot. 16: 382. 1940; Moldenke, Prelim. Alph. List Invalid Names 12 & 13. 1940; Worsdell, Ind. Lond. Suppl. 1: 160. 1941; Moldenke, Suppl. List Invalid Names 2. 1941; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 56, 58, 59, 71, & 87. 1942; Moldenke, Alph. List Invalid Names 10 & 11. 1942; Moldenke, Phytologia 2: 94. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 386. 1946; Moldenke, Alph. List Cit. 1: 91, 103, 161, 207, 217, 235, & 255 (1946) and 2: 359, 404, 506, 556, 565, & 566. 1948; H. N. & A. L. Moldenke, Pl. Life 2: 67 & 70. 1948; Hara, Enum. Sperm. Jap. 1: 184. 1948; Moldenke, Castanea 13: 120. 1948; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 131, 133--135, 157, & 177. 1949; Moldenke, Alph. List Cit. 3: 657, 666, 702, & 727 (1949) and 4: 1011, 1102, 1200, 1202, 1226, 1238, 1242, & 1299. 1949; Moldenke, Phytologia 3: 139 (1949) and 3: 295. 1950; Lee & Keng, Taiwania 1 (5): 5. 1954; Moldenke, Résumé 168, 172--175, 213, 242, 244, 245, 247, & 444. 1959; Hara, Outline Phytogeog. Japan 65. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 386. 1960; Prain, Ind. Kew. Suppl. 5, pr. 2, 43. 1960; Kitamura & Okamoto, Col. Illustr. Trees & Shrubs Japan 220. 1960; Moldenke, Résumé Suppl. 3: 18 & 30. 1962; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: 1208, pl. 1016. 1962; Chuang, Chao, Hu, & Kwan, Taiwania 1 (8): 54, 59, & 66, pl. 6, fig. 88. 1963; Li, Woody Fl. Taiwan 818, 819, & 944. 1963; Cave, Ind. Pl. Chromosome Numb. 2: 330. 1964; Moldenke, Résumé Suppl. 8: 3. 1964; Ohwi, Fl. Jap. 764. 1965; Moldenke, Phytologia 13: 502 (1966), 14: 37, 107, 111, & 113 (1966), and 14: 244 & 245. 1967; Moldenke, Résumé Suppl. 15: 17. 1967.

Illustrations: Nakai, Trees & Shrubs Indig. Jap., ed. 1, 340 (1922) and ed. 2, 1: 459, fig. 218. 1927; T. Itô, Taiwan Shokubutu Dzusetu [Illustr. Formos. Pl.] pl. 604. 1927; Kanehira, Formos. Trees, ed. 2, fig. 601. 1936; Terazaki, Suppl. Illustr. Fl. Jap. fig. 2486. 1938; Liu, Illustr. Nat. & Introd. Lign. Pl. Taiwan 2: pl. 1016. 1962; Chuang, Chao, Hu, & Kwan, Taiwania 1 (8): 66, pl. 6, fig. 88. 1963.

Recent collectors describe this plant as a shrub or big shrub, a bush, or a small tree, woody or semi-woody, erect, 1--4 m. tall, the flowers scented, and the fruit white and juicy. The chromosome number is $n = 17$. Chung refers to it as an "herb, 2 m. tall". The corollas are described as "red" on W. T. Tsang 21573, "pink" on Fung 20404 and Tsao 1507, "reddish-purple" on W. T. Tsang 21167, "pinkish-purple" on H. H. Chung 2792, "light-purple" on H. H. Chung 2976, "purple" on H. H. Chung 2475, "purplish" on Ching 2009, "reddish-blue" on Kan 1077, and "green" on Tsui 48.

The species belongs to the Group Tubulosae Briq. Kan reports that the leaves are used in medicine in Chekiang. It has been found growing in silt and sandy soil in swamps, in loam, in dry land on wooded hillsides, dry places in woods, thickets, open scrub, and ravines, on grassy or dry and wooded hillsides, open grassy hillsides, hilltops, and moist gentle slopes, and along streamsides, at altitudes of 60 to 830 meters, flowering from

November to January, in March, and from June to September, and fruiting in February, August, and October to December. Tsang says that it is "abundant" in Kwangtung, but Lau refers to it as "rare, as scattered shrubs in sandy soil on gentle slopes" there; Wilson reports it "common" on Formosa, while Fung refers to it as "fairly common" on Hainan.

Because of the considerable controversy as to the correct identification, typification, and nomenclature of this species, and its interpretation by various writers, the original descriptions are given herewith.

Hooker & Arnott's original description of Callicarpa tomentosa and C. loureiri reads as follows: "Callicarpa tomentosa (Willd.?); ramis petiolis pedunculisque fulvo-villosis, foliis oblongo-lanceolatis acuminatis basi ovatis margine glanduloso-dentatoserratis supra laevibus demum glabratis nervis dense pubescentibus subtus floccoso-tomentosis junioribus utrinque canis, pedunculis petiolum subaequantibus, corymbis trichotomis densifloris calycibusque villosis, staminibus longe exsertis. -- Willd. En. Hort. l. p. 158 ? -- C. americana, Lour. Fl. Coch. l. p. 88. Hab. Canton; Mr. Millet, Island of Pootoy (or Grand Ladrone), Chicow, and the Lama; Rev. G. H. Vachell, no. 91. Willdenow's description is scarcely sufficient, nor did he seem to know from whence his specimens came; if our species prove distinct, it may be called C. Loureiri, for it is undoubtedly the plant of Loureiro. In C. cana of Linnaeus, Vahl, Roxburgh, and Wallich, the leaves are cuneate at the base, becoming, as it were, half decurrent along the petiole. Either the present or the following one is probably C. Revesii of Wallich's list, which we have not seen."

Walpers' original description of C. roxburghii (1845) is as follows: "C. Roxburghii Wall. Catal. 1833. -- Ramis teretibus, petiolis et inflorescentiae ramis densissime ferrugineo-lanatis; foliis brevissime petiolatis e basi ovata elliptico-lanceolatis, acuminatis, basi integris, caeterum serrulato-dentatis, supra glabriusculis nervoque medio ferrugineo-tomentello, infra densissime albo-tomentosis subpenninerviis; cymis axillaribus subglomeratis brevissimis dichotomis; calycibus albo-lanatis. Petioli 3 lin. longi, folia 8-pollicaris, 2 -- 2 1/2 poll. lata vel majora, longe acuminata, basi attenuata, infra densissime stellata-tomentosa. Cymae brevissimae, dichotomae glomeratae. -- C. incana Roxb. non C. cana L. -- Crescit in India orientali. -- An re vera a C. macrophylla diversa ?? (v. s. sp.)." P'ei (1932) adds "In Wallich's List No. 1833. the plant is indicated by the words 'H. C.' indicating that it was cultivated in the Botanic Garden, Calcutta; it undoubtedly was introduced from Southern China." He says, further: "This species has long been considered to represent Callicarpa tomentosa Willd. Although the type of Willdenow's species is apparently not extant, for Dr. Diels informs us that there is no specimen in the Willdenow Herbarium, it seems clear from his description that Willdenow had a different species. In any case the name tomentosa is invalidated by the earlier."

He describes the species as follows: "Flowers sessile. Calyx woolly without, glabrous within, very prominently 4-toothed; teeth about 0.2 cm. or more in length, slender, elongated. Corolla sparsely pubescent without, glabrous within, 4-lobed; corollatube about 0.2 cm. in length. Stamens 4, exserted; anthers less than 0.1 cm. long, open by longitudinal slits. Style exserts the stamens. Ovary glandular."

Just what P'ei means by his footnote statement "Although this binomial is clear than C. Roxburghii Wall., except as the latter appears in 1833 as a nomen nudum, we do not consider it effectively published." The name, C. roxburghii, was first proposed in 1829, with "1833" as the Wallich Catalogue number of the species, not a date. If his word "clear" is a misprint for "earlier", then it could apply to C. americana Lour. or C. tomentosa Willd., both of which are invalid homonyms and therefore not available, but not because they were not "effectively published". His statement that Wallich's list gives "H. C." as the locality of collection is also incorrect. The list actually gives "H. Bl." as the source of the plant, indicating "Herb. Blume" and not that "it was cultivated in the Botanic Garden, Calcutta". P'ei also misdates the Hooker & Arnott publication as "1841" instead of 1836. Actually the dates when the various parts of Hooker & Arnott's important work were published are as follows:

pages 1 to 48, plates 1 to 10 -- 1830
 pages 49 to 144, plates 11 to 29 -- 1832
 pages 145 to 192, plates 30 to 39 -- 1833
 pages 193 to 288, plates 40 to 59 -- 1836
 pages 289 to 384, plates 60 to 79 -- 1838
 pages 385 to 432, plates 80 to 89 -- 1840
 pages 433 to 485 -- 1841

Willdenow's original description (1809) reads "Callicarpa tomentosa. C. foliis ovatis acuminatis inaequaliter crenatis basi rotundato-attenuatis integerrimis subtus albo-tomentosis, ramis dense lanato-tomentosis. Habitat.....†. C. Rami et Petioli lana alba dense tomentosi. Folia tri- s. quadripollicaria ovata acuminata, margine grosse inaequaliter crenata basi rotundato-attenuata, apice et basi integerrima, supra viridia, fasciculis pilorum sparsis obsita, subtus albo tomentoso aequali obducta. Flores nondum vidi. Valde similis C. americanae, cujus foliorum basi cuneata et tomentum tenuissimum, habitusque differans. Callicarpa cana ab hac diversa: foliis basi cuneatis margine acute denticulatis tomento subtus et ramulorum tenuiori. A C. lanata toto coelo diversa." This reference is sometimes cited as "1808", but the actual date of publication was 1809.

Walpers' description (1852) of C. tomentosa is as follows: "Callicarpa tomentosa Willd. -- Schauer in DC. l. c. 647. no. 28. -- Hance, Diagn. pl. nov. Austr. Chin. II. 4. -- Arbuscula: ramulis pedunculisque cum inflorescentia, ramis petiolisque tomento densissimo cinnamomeo villosa-hirsutis; foliis oblongo- vel

lanceolato-ellipticis breviter petiolatis, basi cuneatis, apice longe acuminatis, supra medium tenuiter serrato-dentatis, adultis supra opacis, venis subtiliter et sparse cano-pubentibus, caeterum glabris, subtus praesertim in venis venulisque prominulis pilis stellatis candicantibus dense tomentosis, utrinque minutissime glanduloso-punctatis; cymis breviter pedunculatis confertis glomerulosis; calyce dense tomentoso-villoso tubuloso quadrangulato quadripartito, laciniiis lanceolato-subulatis. — Folia 9 poll. longa (incl. petiolo pollicari), 3 1/2 — 4 poll. lata. Pedunculi petiolum subaequant. Cymae ter quaterve bifidae, bracteolae subulatae, pedicellos aequantes; flores in apicibus inflorescentiae ramulorum densissime glomerati. Calyx 2 lineas longus albo-villosus. Corollae roseo-purpureae tubus glaberrimus, calyce inclusus, limbi exserti extus villosuli laciniae obtusae. Stamina longissime exserta. — Species pulcherrima a Celeb. Schauer in DC. Prodr. XI. 647. inter recognoscendas relegata, C. Zollingerianae Schr. C. mollis Sieb. & Zucc. et praecipue C. Roxburghii Wall. affinis. -- Habitat in insula Hongkong Sinensium."

Bakhuizen van den Brink's (1921) description is also noteworthy in this connection: "Callicarpa Roxburghii Wall. Cat. No. 1833 (1828) ex Walp. Rep. Bot. Syst. IV (1844--1848) p. 127; Schau. in DC. Prod. Syst. Nat. XI (1847) p. 640. — C. tomentosa (not. of Murr.) Willd. Enum. Plant. (1809) p. 158. — C. longiloba Merr. Phil. Journ. Sc. Bot. XIII (1918) p. 156. — A shrub or small tree; branchlets, cymes and petioles densely villous or woolly; leaves rather large, membranous, oblong or sublanceolate, base obtuse or cuneate, shortly attenuate, apex rather long acuminate, margins serrate-dentate, except at the base and the top, upper side, when adult, glabrous or with some stellate hairs, lower side softly white or greyish tomentose; pairs or nerves 10--15; 10--20 c.M. by 3.5--10 c.M.; petioles 1--2.5 c.M.; cymes rather small, globose-glomerulate, 2--4 c.M. long, 3--5 c.M. in diam.; peduncles short, 1.5--2 c.M. long; calyx tubular, densely floccose outside, 0.3--0.5 c.M. long; segments 4, lanceolate, 0.20--0.25 c.M. long; corolla shortly exsert, 0.30--0.45 c.M., tube glabrous, segments 4, ovate, 0.10--0.12 c.M. long, 0.15--0.20 c.M. broad, densely villous outside; stamens 0.5--0.7 c.M.; anthers glandular, 0.07--0.10 c.M.; style 0.6--0.8 c.M. with subpellate or obscurely 2--4-lobed stigma; ovary hairy and glandular; drupe somewhat hairy and glandular on the top, white when mature, 4-seeded. Hongkong: Hance No. 337; Weisz No. 2588. Distribution: S-China: Hongkong! Canton! Amoy! Kwangsi!"

Under the present edition of the International Rules of Botanical Nomenclature the original publication of the name, C. loureiri, by Hooker & Arnott (1836) and used for the past 33 years as the accepted name for the species is not a valid publication, since the authors merely proposed it as an alternative or provisional name, not definitely accepted by themselves at that time. This is another unfortunate example of the fallacy of the claim that the ever more complicated "International Rules" maintain "stability in nomencla-

ture". In another unfortunate example in this family, Casselia, they forced the abandonment of a generic name validly adopted by the monographer of the genus in his generic monograph and the subsequent publication of five new combinations.

Ohwi's description (1965) of this taxon is sufficiently important to be repeated here: "Callicarpa kochiana Makino. C. tomentosa sensu auct. Japon., non Willd.; C. longiloba Merr. — Birōdo-murasaki, Oni-yabu-murasaki. Deciduous shrub with pinnately branched yellow-brown hairs; branches thick, terete, villous; leaves chartaceous, narrowly oblong, broadly lanceolate, or ovate-oblong, 15—30 cm. long, 4—8 cm. wide, long-acuminate, gradually narrowed at base, serrulate, with gray-yellow stellate and pinnately branched hairs beneath, obsoletely grandular-dotted, the lateral nerves 8—12 pairs, the petioles 2—3.5 cm. long; cymes densely many-flowered, short-pedunculate; calyx 5-parted, the lobes broadly linear; corolla about 1.5 mm. long; anthers oblong, about 0.5 mm. long; fruit about 2 mm. across, enclosed by the calyx, white. — Aug. Honshu (s. Kinki Distr.), Shikoku, Kyushu (s. distr.). — Formosa, China, and Indochina."

In regard to the identity of C. roxburghii Wall., the following memorandum from Drs. T. A. Sprague and C. E. C. Fischer, dated August 18, 1931, is extremely important: "(1) The name Callicarpa Roxburghii was published by Wallich, Cat. n. 1833 (1828-29) as a new name for C. incana Roxb., non C. cana L. It was effectively published since it is associable with the description of C. incana Roxb., but is an illigitimate name because it was superfluous. (2) Walpers, Rep. iv. 127 (1844-48) published a description of C. Roxburghii apparently based on Wall. Cat. n. 1833, specimen. A much better description of Callicarpa Roxburghii Wall. Cat. n. 1833, specimen, was published by Schauer in DC. prodr. xi. 640 (1847). This mentions the setaceous calyx-lobes. (3) C. B. Clarke (F. B. I. iv. 568) and Lam (Bull. Jard. Bot. Buitenz. ser. 3, iii. 23) reduce C. incana Roxb. to C. macrophylla Vahl, apparently correctly. (4) Callicarpa Roxburghii Wall. (1828-29) is accordingly a taxonomic synonym of C. macrophylla Vahl. (5) The specimen of Callicarpa Roxburghii Wall. Cat. n. 1833 described by Walpers (?) and Schauer belongs, however, to a different species, namely to the South Chinese Callicarpa included in Index Pl. Sin. ii. 255 (1890) as C. tomentosa Willd. It has the characteristic calyx-lobes of this South Chinese plant. (6) The South Chinese plant concerned should therefore, as suggested by Dr. Merrill, bear the name C. Loureiroi Hook. et Arn. with "C. Roxburghii Wall. ex Schauer (1847), excl. syn." as a synonym. Even if Lam (Bull. Jard. Bot. Buitenz. ser. 3, iii. 22: 1921) is correct in identifying it with C. tomentosa Willd. (1809), that name cannot be used, since it is a later homonym of C. tomentosa (L.) Murr. (1774)." To this lucid clarification of the situation Dr. Merrill has appended a notation "The binomial Callicarpa Loureirii does not appear in Index Kewensis." Dr. Merrill and I both used this memorandum as the basis for

our acceptance of C. loureiri Hook. & Arn. as the proper name for this taxon, in spite of an earlier letter from Dr. Sprague alone, dated June 4, 1930, in which he had stated "I really do not know whether -- under the International Rules, edition 2 (1912) -- the name Callicarpa Loureiri is validly published or not. Under the new text proposed by the British Sub-Committee on Nomenclature, however, it is not validly published." Unfortunately, this British Subcommittee proposal has now been accepted as part of the current edition of the ever-changing "rules". Hence, C. loureiri, has to be discarded in favor of C. kochiana, proposed 78 years later! The originals of both these memoranda are preserved in the Britton Herbarium at the New York Botanical Garden.

It should perhaps be reiterated here that I am following P'ei (1932) in regarding C. incana Roxb. as a synonym of C. macrophylla Vahl and C. americana Lour. as a synonym of C. candicans (Burm. f.) Hochr. Numerous workers have considered C. roxburghii Wall. as a synonym of C. kochiana or even as the correct name for it (e.g., Bakhuizen van den Brink, 1921, and P'ei, 1932), but I agree with Jackson (1893) and with Sprague & Fischer that it belongs in the synonymy of C. macrophylla Vahl. The C. roxburghiana Schult. and C. roxburghiana Roem. & Schult., however, belong in the synonymy of C. longifolia f. floccosa Schau.

The C. tomentosa accredited to König is actually C. macrophylla Vahl, that accredited to Thunberg is C. longifolia Lam., that attributed to Bakhuizen van den Brink is in part C. arborea Roxb. and in part C. integerrima Champ., that attributed to Lamarck and to "L. ex Spreng." is C. candicans (Burm. f.) Hochr., that attributed to "L. ex Moldenke" is C. erioclona Schau., that attributed to Murray, to "L. ex Willd.", and to "(L.) Santapau" is C. tomentosa (L.) Murr., a valid species, while the C. tomentosa of Vahl has not yet been satisfactorily placed.

Vernacular names recorded for C. kochiana are "birōdo-murasaki", "birodomurasaki", "Koch beauty-berry", "oni-yabumurasaki", "oni-yabu-murasaki", "taai toh fa", "taiwan sirosikibu", "tai yan mat", and "tsang mo fung".

Lee & Keng (1954) inform us that the species is found among shrubs and small trees in the upper sections at elevations of 550 to 1000 meters on Formosa, growing with treeferns. Fung 20404 represents a small-flowered race, greatly resembling C. macrophylla in habit.

Keng reports that this is a "shrub 1 m. or more in height, the lower part of the stem covered with blackish pubescence, while the upper part of it with yellowish pubescence, leaves oblong, tapering into both ends, flowers much hairy below, purple, in axillary and terminal peduncled cymes." Kuntze 3374 has its stems covered with many scale-insects among the hair.

Callicarpa kochiana certainly seems closely related to C. lobo-apiculata Metc. and I wonder if the two taxa are really specifically distinct.

BOOK REVIEWS

Alma L. Moldenke

"AN ENGLISH-CLASSICAL DICTIONARY FOR THE USE OF TAXONOMISTS" compiled by Robert S. Woods, xiii & 331 pp., Pomona College Publication, Claremont, California 91711. 1967. \$5.50.

This is a very useful book for all botanical and zoological taxonomists, but especially for the bright, new crop whose earlier training has often bypassed the Latin and Greek declensions, conjugations, and vocabulary. The author wisely omitted ambiguous terms. The book may find its primary use as a source for selecting epithets for new taxa.

As fine as this book is, it is completely eclipsed by Stearn's "Botanical Latin" which appeared about the same time and which offers so much more in content, explanations, history, etc. There are just a few strictly zoological terms in Wood's book that are not in Stearn's. Since so many terms, excluding generic names, are common to both botanical and zoological taxonomy, they are found in Stearn's masterpiece.

"THE DICTIONARY OF THE BIOLOGICAL SCIENCES" by Peter Gray, xx & 602 pp., Reinhold Publishing Corp., New York, Amsterdam, London. 1967. \$14.75.

A tremendous amount of carefully checked work went into this production that surely will provide a great deal of assistance to students of all levels, professionals and interested readers in the total life sciences spectrum wherever in the world English is used. It covers over 40,000 definitions including common names, eponyms, mutant names, gene symbols, derivations, etc. Only those terms that are likely to be sought for their own sakes are listed in the typical alphabetical pattern of dictionaries: the others are arranged in a thesauric manner in which the words are listed according to their meanings.

Even though very much is offered the reader, a few omissions were noted for possible inclusion in future editions. "Fiddle wood" does not appear under "wood" as a common name for Citharoxylum species native to the southernmost parts of this country. No "bramble" or "thorn" whale, recently mentioned in the newspapers, is listed under "whale". "Shittim", under "wood", is equated only with the southern Halesia carolina and not also the far better known and more important Holy Land tree, Acacia seyal or A. tortilis. Under "tree" there is no entry for "chaste tree", the common name used for the genus Vitex. "Pipewort" is not listed as the common name for the genus Eriocaulon and the entire family to which this genus belongs. "Forb" is defined as

"any plant in a meadow or prairie which is not a grass" instead of the more accurate "which is not grasslike or glumaceous". Forbs are broad-leaved; they do not include sedges or rushes. The alternate spelling -- phorb -- appears occasionally in the literature of ecology but not in this dictionary.

"TREES AND SHRUBS OF MILLS COLLEGE" by Baki Kasapligil, 56 pp., illus., Mills College Publications, Oakland, California. 1967. \$1.95.

This handy, attractive booklet is the acknowledged, painstaking result of botany and art students' efforts under the direction of Dr. Kasapligil. It gives numbered locations, common names, scientific names, geographical origins, brief descriptions, and a map.

On page 5 the unusual spelling "rhyzome" occurs.

The general effect of the work is a professional appearance, rather than an amateur student one.

"THE PHYSIOLOGICAL CLOCK" by Erwin Bünning, 167 pp., illus., revised second edition, Heidelberg Science Library Volume I, Springer-Verlag Inc., New York 10010 & Berlin. 1967. \$3.00.

The Heidelberg Science Library consists of a paperback series of titles for interested laymen in contrast to the erudite research works for which this company has long been so famous. Because of the text format the valuable, concise, carefully and lucidly explained content may be ignored by the general reader, but certainly not by the student guided by the knowing teacher. The rich bibliographic material at the end of each chapter is often so abbreviated that it would be an obstacle to the non-scientifically trained reader. This work was first published in German in 1958 and has been completely modernized since then.

"This book is restricted to the physiological measurement of time, which is brought about by means of oscillations with periods of approximately 24 hours, that is by the 'endogenous diurnal rhythm'. Such rhythms are now referred to as circadian."

"For an ultimate understanding of these systems we must turn to the genetic and molecular level; inevitably we are seeking the solution to the question of mechanism in terms of chemical activities and transformations."

It culls thoroughly from all the pertinent field observations and experiments upon all kinds of plants and animals, including man.

"CELL FUNCTION" by L. L. Langley, xiii & 364 pp., illus., second edition, Reinhold Publishing Corporation, New York 10022, Amsterdam & London. 1968. \$10.00.

This is practically a newly written book that has had the advantage of a trial precursor. It is planned for the undergradu-

ate level and is blessed with clarity of explanation, excellent summaries at the end of each chapter, fine illustrations, easily readable print, and wise format.

The last sentence on p. 345 has a grammar problem with "these" and "its".

Some of the illustrations, as that of the mitochondria on p. 207, give no inkling as to what organisms and/or cells were photographed.

"THE LAND, WILDLIFE, AND PEOPLES OF THE BIBLE" by Peter Farb, xiii & 171 pp., illus., Harper Row Publishers, New York 10016, Evanston (Illinois) & London. 1967. \$3.79.

Surely this book was sent to us because of our studies in and publications about the botanical identification of the plants and plant products mentioned in all English translations of the Bible, and not because PHYTOLOGIA is likely to be read by those interested in advanced juvenal books. Actually this book makes for very pleasant adult reading. It is good to know that its botany, zoology, history and geography are basically accurate. The book is attractively illustrated.

"BAJA CALIFORNIA AND THE GEOGRAPHY OF HOPE" edition by Kenneth Brower, text by Joseph Wood Krutch, photographs by Eliot Porter, foreword by David Brower, 171 pp., illus., Sierra Club, San Francisco, California 94104. 1967. \$25.00.

This new seventeenth volume in the Sierra Club Exhibit Format Series, like its predecessors, pleases through its exquisite beauty of colored photographs, of 'Octavio Paz' poetry in Spanish and in English translation, and of the text for the cherished guarding of the wilderness condition of the area. The main reason for its preservation to date has only been the impoverished Mexican government's inability to build good accessible roads! Hopefully the reading of such books as this and the varied efforts of conservationists the world over may postpone or, better still, prevent the onset on "Coney Island culture" and its subsequent destruction in the "Baja".

There is a fine detailed map of the area at the end of the book showing the euphemistically labeled "roads", terrain, gas-line and shelter availability, and airports.

The unobtrusive use of more scientific names would have been helpful to many readers. Idria columnaris is misspelled.

"ARID LANDS - A GEOGRAPHICAL APPRAISAL" edited by E. S. Hills, xviii & 461 pp., illus., Barnes & Noble, Inc., New York 10003; Methuen & Company, Ltd., London; UNESCO, Paris. 1967. \$13.50.

Including the editor, seventeen outstanding specialists in various fields associated with desert conditions have been participants in the UNESCO Arid Zone Programme which had the objec-

tive of promoting research into arid regions from every relevant scientific point of view and with the eventual hope of improving living conditions in these areas. There are papers on the world's arid areas, their meteorology, their geomorphology, their soils, their water supply and its management, their human problems, their land use, their social life and crafts, their plant and animal life, and their history and future.

The article on "Plant Life in Deserts" is particularly well developed and documented by Dr. M. Kassas of the University of Khartoum.

This is a needed book since it is the only one with its coverage. The writing is textual in style, making it excellent for explanation of content but not conducive to general reading. It is rich in bibliographic material that is so abbreviated that only trained scientists could handle it unaided. The book is well illustrated.

"TAXONOMY OF FLOWERING PLANTS" by C. L. Porter, second edition, vii & 472 pp., illus., W. H. Freeman & Co., San Francisco 94104 and London. 1967. \$7.75.

This revised text grew out of not only a good first edition but more out of thirty years of classroom teaching and concomitant text building. It is oriented for a semester or year course for undergraduate agronomy, range management, forestry, wildlife management and conservation students. It shows — insufficiently — some newer aspects of taxonomy and some newer references. The illustrations have been both improved and increased; they are excellent. The print is easy to read and the text is easy to comprehend. Unfortunately a few errors in spelling (e.g., scientific names of the palm family, the lupine genus, a magnolia species) and in scientific names (e.g., for the avocado, cinnamon, lemon) were not checked.

The book emphasizes the floral diagram very effectively as a teaching device. It is not slanted regionally, and so can be used throughout our country and with liberal arts students as well.

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NOTES ON NEOTROPICAL EUPHORBIACEAE

3. Synopsis of Caribbean *Sapium*

E. Jablonski
New York Botanical Garden

When working on the Euphorbiaceae of the Guayana Highland I frequently had to extend my studies over the whole of South America. Here I encountered great difficulties with the genus *Sapium*. The variability of characters, coupled with a lack of morphological discontinuity between the species, made the impression of a high plasticity of subgeneric taxa and a free flow of genes, probably also combined with a great deal of introgression.

Extending my studies subsequently to the Caribbean area I was pleasantly surprised by the decrease of difficulties and the sharpness of morphological boundaries between the species, especially in the West Indies. Although the differences between the individual species remain small and the variability great, the specific limits are better defined and the flow of genes less free.

It is interesting to follow *Sapium jamaicense* from West to East through Cuba, Jamaica, Hispaniola to Porto Rico, where its distribution ends sharply; but before it ends completely it gives rise to a closely related, well defined local species *S. laurocerasus*. This is not the case when tracing *S. jamaicense* westward into Central America and southern Mexico. Here *S. pleiostachys* appears on the scene as a local, closely related species, connected with transitional forms and only acceptable as a separate entity because of the complete lack of this form in the east.

It is true that the collections are much more complete in the West Indies than in southern Mexico and Central America, which makes the geographical comparisons less reliable.

An interesting feature is the close relationship of the group *cuneatum* - *leucogynum* - *haitiense* - *adenodon* - *maestrense* - *cubense* - *moaense* - *parvifolium* and *erythrospermum*. All endemics concentrated in a small area between Jamaica, Cuba Oriente, and the western tip of Haiti, they are characterized by cuneate leaf form, unpronounced submerged lateral nervature and lack of petiolar glands. Although these forms are all closely related, their specific limit is sharp and definite.

Sapium is confined to the tropics. It hardly crosses the geodetical limits of the Tropics of Cancer and Capricorn. The southern limit is reached only by xerophytic types, and Dr.

Howard Irwin informs me that this line corresponds to the Frost Line. The northern limit is in the Sonoran Desert and is reached by two species: S. pedicellatum and S. lateriflorum.

As defined today, Sapium is restricted to the neotropics and its place in the paleotropics is taken by Excoecaria. The two genera are no doubt closely related, but differ sharply in the male calyx which is synsepal and bifid in Sapium with wide lobes, and gamosepal and divided into 2-3 free sepals in Excoecaria. In addition, Excoecaria never has any petiolar glands and its seeds are not arillate or carunculate, but completely enclosed in the epidermis, and the bracts are not conspicuously biglandular at the base, as in Sapium.

Leonard has questioned recently the validity of this distinction (Bull. Jardin de l'Etat 29: 133-146. 1959). More knowledge of African Excoecaria will be necessary on my part to enable me to discuss Leonard's objections.

The name Sapium first appeared in the literature in Patrick Browne: The civil and natural history of Jamaica 1756, where he described it as Sapium I, without a specific epithet. In all probability it represented what we call today S. jamaicense Sw. 1829.

Jacquin gave a generic description in Enum. Plant. Carib. 9. 1760 of Sapium and provided it with a specific epithet aucuparium without specific description, so the epithet remained invalid.

The nomenclatural vicissitudes of Sapium, however, goes back to the first and second editions of Species Plantarum where Linnaeus described Hippomane glandulosa in the first edition which he corrected in the second edition to biglandulosa. This binominal is so broadly conceived that it could include the entire genus Sapium without its eglandular species. Linnaeus acquired Browne's herbarium in 1758, but there is no indication in the second edition that he changed his mind in regard to the broadness of his concept.

In 1866 DC. Prodr. 15,2 and in Mart. Fl. Bras., Muller transferred Sapium to Excoecaria, whereas Baillon (Etude General des Euphorbiacees. 1858) included it in his broadly circumscribed Stillingia.

Pax retransferred the neotropical portion of Muller's Excoecaria back to Sapium, and in the following we accept Pax' interpretation.

In my Synopsis of South American Sapium I distinguished 58 species. To this we now have to add 27 Caribbean species, bringing the total to 85.

It is well to keep in mind that the number of binominals will have to be reduced when more material becomes available. The binominals: harrisii, bourgeaui and nitidum also may become synonyms of cuneatum, oligoneurum and lateriflorum.

The key presented below refers to Caribbean species only. A key to comprise the entire genus Sapium with its 85 species will yet have to be constructed at a future date.

Clavis Specierum Caribaeo-Americanarum

1. Patentinervia. Costae secundariae numerosae, densae filiformes, rectae, sub marginem tantum adscendentes vel dictyodromae. Folia praecipue majora 11-14 (35) cm longa, 4-6 cm lata, ovata vel late ovato-lanceolata, apice rotundata cum acumine parvo, plana nunquam cucullata vel unguiformia, basi late cuneata vel rotundata. Spicae apice ramulorum plures in fasciculas confertae. Glandulae petiolares obsoletae vel inconspicuae. Petioli longi.
2. Costae secundariae angulo 70°-80° insidentes, sub marginem tantum arcuato adscendentes.
3. Glandulae petiolares obsoletae (Jamaica, Cuba, Hispaniola, Porto Rico, Honduras, Guatemala, Chiapas). 1. jamaicense
3. Glandulae petiolares parvae, sed distinctae (Guatemala, Costa Rica, Panama). . . . 2. pleiostachys
2. Costae secundariae angulo 80°-90° progredientes, sub marginem dictyodromae; glandulae petiolares distinctae. Folia vulgo minora 7-14 cm longa rotundata, apice rotundata vel obtuse acuminata (Porto Rico). 3. laurocerasus
1. Costae secundariae paucae, laxae, arcuato adscendentes vel rectae. Ramuli spicas singulas terminales gerentes.
4. Glandulae petiolares distinctae.
5. Lamina apice cucullato-introflexa vel unguiformia.
6. Centro Americana. Folia vel rotundata vel lanceolata et longiora quam 10 cm.
7. Folia lanceolata praecipue longiora quam 10 cm.
8. Capsula sessilis. Costae secundariae rectae vel subrectae. Folia basi obtusa vel acuta margine praecipue serrata (Colombia, Panama). 4. aucuparium
8. Capsula distincte stipitata. Costae secundariae arcuato adscendentes, fere prominulae.
9. Folia margine integra. 5. thelocarpum
9. Folia margine leviter crenulata. Capsula ignota; folia lanceolata, 13 cm longa, 4 cm lata. 6. bourgeaui
7. Folia rotundato-elliptica, 8 cm longa, 4 cm lata, apice variabile cucullata

- vel unguiformia. Costae secundariae paucijugae, subtus crebre prominulae. Capsula sessilis vel stipitata. . . 7. oligoneurum
6. Occidentali Indiana. Folia lanceolata et minus quam 10 cm longa.
10. Glandulae petiolares anguste cylindricae frequenter sub marginem laminae inflexae.
11. Folia leviter cucullata, 6-9 cm longa. Costae secundariae rectae, non prominulae sub marginem occultae (Cuba, Oriente). 8. daphnoides
11. Folia crebre cucullata lanceolata vel elliptica. Costae secundariae arcuatae prominentes (British Guiana, Trinidad, Tobago, Barbados). . . 9. hippomane
10. Glandulae petiolares hemisphaericae. Folia lineari vel elliptico-lanceolata, 3.5-4.5 cm longae, 1.2-1.6 cm lata, cucullata, sed cucullae parvae. Costae secundariae rectae patentes non prominulae. Ovarium biloculare. . . 10. buchii
5. Lamina apice plana.
12. Folia alterna.
13. Folia papyracea, evenia elliptico-lanceolata 7-14 cm longa, 3-6 cm lata (N. Antilles). 11. caribaeum
13. Folia coriacea, costae fere prominulae (Am. Centr., Mexico).
14. Glandulae petiolares elongatae cylindricae vel conicae divaricatae.
15. Capsula majuscula 2 cm longa et lata. Costae secundariae subrectae non prominulae. Folia lanceolata utrinque acuta subtus pallidiora. 12. macrocarpum
15. Capsula minora. Costae arcuato adscendentes. Folia majuscula late elliptica utrinque olivacea.
16. Capsulae sessiles. Spicae crassiusculae terminales. Folia majora 8-21 cm longa, 4-7 cm lata basi praecipue rotundata. Glandulae petiolares conicae. 13. pachystachys
16. Capsulae distincte stipitatae. Spicae tenues. Glandulae petiolares tenues circinales. Ramuli spicigeri laterales. Folia latiuscula. 14. pedicellatum
14. Glandulae petiolares adpressae vel hemisphaericae.
17. Ramuli spicigeri laterales. Folia majuscula 18-20 cm longa, 5 cm lata. 15. lateriflorum

17. *Ramuli spicigeri terminales. Folia minora*. 16. nitidum
12. *Folia subopposita, minora 3-6 cm longa, 2-4 cm lata, orbiculari-elliptica margine irregulariter pauci-glandulosa. Speciei photogr. tantum vidi ("Nueva Espana")*. . 17. ruizii
4. *Glandulae petiolares nullae.*
18. *Glandulae basilares nullae (nec petiolares, nec laminae adnatae).*
19. *Folia basi anguste cuneata.*
20. *Folia majuscula (10-17 cm longa) coriacea (Jamaica).*
21. *Ovarium sessile*. 18. cuneatum
21. *Ovarium stipitatum*. 19. harrisii
20. *Folia minora (7-10 cm longa, 3.5-4.3 cm lata) membranacea.*
22. *Folia margine tenuissime dentata.*
23. *Spicae axillares. Styli liberi. Stipulae minusculae. Folia margine eglandulosa (Cuba Occid.)*. 20. leucogynum
23. *Spicae terminales. Styli connati ad 2/3 longitudine. Stipulae 2 mm longae. Folia supra basin margine utrinque glandulis 1-2 sessilibus parvulis instructa (Haiti)*. 21. haitiense
22. *Folia margine grosse dentata (Cuba Oriente)*. 22. adenodon
19. *Folia basi late cuneata vel rotundata.*
24. *Folia majuscula (4-10 cm longa, 2 cm lata).*
25. *Folia apice cuneata.*
26. *Folia apice acuta et cucullata, margine tenuissime dentata. Spicae masculae 1 cm longae (Cuba Oriente, regio Maestra)*. 23. maestrense
26. *Folia apice obtusa nec cucullata, margine grosse dentata. Spicae masculae 3 cm longae. Folia 8 cm longa, 3 cm lata (Cuba Oriente, regio Moa, Nipe et Maestra)*. 24. cubense
25. *Folia apice rotundata vel emarginata coriacea, supra nitidula, (Cuba Oriente, regio Moa)*. 25. moaense
24. *Folia minora, elliptica 2.4 cm longa, 1 cm lata, subtus brunnea (Cuba Oriente, regio Moa, Nipe, Baracoa)*. 26. parvifolium
18. *Glandulae basilares, (non petiolares) parvae, interdum obsoletae, si adsint laminae adnatae.*

27. Folia minora, minus quam 5 cm longa, (3-4.5 cm longa, 1.1-1.2 cm lata), coriacea, pallida. Glandulae ad laminam adnatae hemisphaericae. Denticulae marginis foliorum dorso bulboso incrassatae (Cuba Oriente). . . 27. erythrospermum
27. Folia plus quam 5 cm longa.
28. Folia orbiculari-elliptica (7 cm longa, 4-5 cm lata), margine integra. Glandulae tenues interdum sub laminam occultae (Costa Rica). 28. pittieri
28. Folia lanceolata 6-8 cm longa, 3-4 cm lata, margine crebre glanduloso-ciliata. Costae secundariae 10-jugae. Specimen non visum mihi tantum ex photogr. notum ("Nueva Espana"). . . 29. simile

1. SAPIUM JAMAICENSE Swartz

Adnot. Bot. 62. 1829; Urban, Symb. Antill. 3: 308. 1902; Huber in Bull. Herb. Boiss. Ser. 2, 6: 347, f. 2. 1906; Hemsley in Hook. Ic. Pl. 29, tab. 2889. 1909; Pax et K. Hoffm., Pflanzr. 52: 205. 1912; Fawcett et Rendle, Fl. of Jamaica 325. 1920; Bro. Alain, Fl. de Cuba 3: 113. 1953. Sapium I Patr. Browne, Civ. Nat. Hist. Jamaica 1756.

Arboreum foliis ellipticis glabris, petiolis biglandulosis, floribus spicatis.

Sapium laurifolium Griseb., Fl. Brit. West Ind. Isl. 49. 1859.

Sapium laurocerasus var. ellipticum Mull. Arg., Linn. 32: 116. 1863.

Sapium laurocerasus var. laurifolium Mull. Arg., Linn. 32: 116. 1863.

Stillingia laurifolia Richards in Sagra Hist. Fis. Cuba 11: 201, tab. 69. 1850.

Excoecaria laurocerasus var. elliptica et var. laurifolia Mull. Arg. in DC. Prodr. 15, 2: 1203. 1866.

Sapium aucuparium Croizat, Jour. Arn. Arb. 24: 174. 1943 non Jacquin.

Sapium anadenum K. Schuman & Pittier in Contrib. U.S. Nat. Herb. 12: 164. 1908 pro parte, quoad specimina costaricensia.

Typus: Habitat in campis montium Jamaicae, (BM) n.v.

Distribution: Jamaica, Cuba, Hispaniola, Porto Rico, Chiapas, Guatemala and Honduras.

Specimens Examined:

JAMAICA:

Lapland, near Catadupa, El. 1200 ft., Harris 9165 (NY, US, A, A).

Castleton, Castleton, Harris 9194 (NY).

Golden Valley, near Castleton, El. 600 ft., Harris 9195 (US).

Road to Guava Ridge, El. 2200 ft., Harris 9562 (A, NY, US).

Stanmore Hill, El. 2200 ft., Harris 9971 (sterile US, NY).

Bachelor's Hall, Harris & Britton 10713 (NY, US).

Rio Minho Valley, El. 1000 ft., Harris 10882, 10883 (US, NY, GH).

Windsor Trelawny parish, El. 100-150 m, Miller 1538 (US).
Chepstow, El. 250 ft., Proctor 8528 (GH).

Ecclesdown, El. 1000 ft., Howard, Proctor, Wagenknecht 20525 (NY).

One mile southeast of Millbank, El. 700-800 ft.,
Proctor 20656 (A).

Island View Hill, Wilson Valley district, 1.5 miles N of Warsop, Proctor 21848 (NY).

CUBA:

Pinar del Rio: Rangel, Sierra del Rosario, El. 500 m,
Bro. Alain 6516 (GH).

Isle of Pines: San Juan, Britton, Britton, Wilson 15473 (NY, US).

Matanzas: ad fl. St. John, Rugel 256 (Meisner Herb) (NY)

Las Villas: San Blas, El. 800, Rehder 1134 (A, A, US, NY).

Trinidad Mt., Jinblito San Blas, Conzales 586 (NY, A).

Trinidad Mt. near Guanabana, El. 260,
Britton, Earle, Wilson 4767 (NY).

Trinidad Mt., San Blas-Buenos Aires,
Howard 5385 (NY, GH).

Vegas, east of Cienfuegos, Bro. Leon 13957 (NY).

Harvard Tropical Garden, Soledad,
Cienfuegos, J.G. Jack 4265 (US), 5244 (US, NY), 8524 (A).

San Mateo, Jack 8524 (NY, US, A).

San Blas, Jack 5748 (NY, US).

Colonia Limones, Ingenierio Soledad, near
Cienfuegos, Pringle 104 (NY, US, GH).

Mino Carlota, SE of Cumanayagua, Sierra
de San Juan, El. 300-400 m, Senn 310 (NY,
US, GH), R.A. Howard 5620 (NY, GH).

Hoyo de Manicaragua, Britton, Britton,
Wilson 4700 (NY, NY).

Lomas de Banao, Luna 564 (NY).

Gavilanes, Banao Mts., Bros. Leon, M. Roco 8010 (NY).

Bernao Mt., Luna 654 (NY).

Camaguey: Loma del Jaguey, Eggers 4909 (NY, A, US).

Oriente: Puerto Padre, Curbelo 5673 (Hb Roig) (NY).

Bayate, Monte Oscuro (Nipi), Ekman 4618 (NY).

Moa Region, Bro. Leon 21277 (NY).

Baracoa, Canete, Roig 123 (NY).

Baracoa, Valley of Rio Macaguanigua,

Ekman 4306 (NY).

Maisi Plain, Bro. Leon 18290 (NY).

Southern Baracoa Region, Janco-Assiba, Bro. Leon 11813 (NY).

Gran Piedra, Mt. Santiago, Bro. Clemente 6554 (GH).

Road to Olimpo, Gran Piedra, Bro. Clemente 7149 (GH, NY).

Ensenada de Mora River Valley, Britton, Cowell, Shafer 12939 (NY, US).

"Cuba Orientae", Wright 578 (Torrey Herb.) (NY, US, GH).

HAITI:

Vicinity of Basse Terre, Tortae Isl., Leonard, Leonard 12426 (NY, GH, A); 13990 (NY, US, A).

Massif de Nord, Port Margot at Riv. Limon, Ekman NH 2920 (US).

Vicinity of St. Michel da Atalaye, Dpt. de Nord, El. 350 m, Leonard 7275 (NY, US); GH.

Massif des Mateux, Mirabalais, below Morne Saint d'Eau and Montagne Terrible, El. 400 m, Ekman NH 5512 (A, US).

Massif de la Selle, Port-au-Prince, near Monfleury, El. 150 m, Ekman 10883 (NY).

Massif de la Selle, Leogane, Fond-de-Boudin, El. 400 m, Ekman NH 2391 (US).

Examined by Bro. Alain (personal inf.):

Petionville, Ekman 2192 (S).

Monfleury, Ekman 10883 (S).

Trouin, Ekman 2391 (S).

DOMINICAN REPUBLIC:

Cordillera Septentrional, prov. Santiago, Las Lagunas El Penon, El. 300 m, Ekman 16211 (US).

Lopez, prov. Santiago, Jimenez 457 (US).

Jovenó near sea level, Abbott s.n. (US).

Trujillo City, Schiffino 128 (GH).

Daguilla, Schiffino 14 (US).

Llano Costero, prov. Santo Domingo, El Manielito, woods beyond Rio Isabel, Ekman 17323 (US).

Paradis prope Barahona, El. 250 m, Turckheim 2827 (US).

Barahona, Padre Fuertes 826 (US, GH, A, A).

El Manielito, Ekman 11323 (S). Pers. Inf. Bro. Alain.

PORTO RICO:

Tabeiba, Holdridge 211 (NY).

Lugullo Mountain, Holdridge 518 (NY).

MEXICO:

Chiapas: Mt. Ovando, El. 800 m, Escuintla, Matuda 16371 (US).

GUATEMALA:

San Felipe, Dpt. Retalhuelu, El. 700 m, J.D. Smith 2607 (US, US, NY).

Finca Moca, Guatalon, Ruehl 1046 (US).

Finca Sepacuite, Alta Vera Paz, Cook & Griggs 250 (US).

HONDURAS:

Lancetilla Valley, near Tela, Dpt. Atlantide, El. 20-600 m, Standley 55608 (US, A).

2. SAPIUM PLEIOSTACHYS Schuman & Pittier

In Contrib. U.S. Nat. Herb. 12: 164. 1908.

Sapium anadenum Pittier in Contrib. U.S. Nat. Herb. 12: 164. 1908.

Typus: Forests of Golfito de Osa, close to seashore, H. Pittier 9906 (7121) (US, US 578902), Comarca de Puntarenas, Costa Rica (GH isotypus)!

Sapium pleiostachys is closely related to Sapium jamaicense and differs from it by the regular presence of well developed petiolar glands. The morphological discontinuity is often obscured by the variability of the glands.

Typical S. jamaicense however, as found in the West Indies, does not show this variation. The transition is encountered only in Central America.

Specimens Examined:

PANAMA:

Dpt. Chiriqui, Cooper & Slater 197 (NY).

COSTA RICA:

Forested hills near Golfito de Golfo Dulce, prov.

Puntarenas, Allen 5991 (US, GH).

In climax forest, region between Rio Esquinas and

Palmar Sur de Osa, Allen 5773 (GH).

Vicinity of El General, prov. San Jose, El. 670 m,

Skutch 4235 (NY, US, A).

Basin of El General, prov. San Jose, El. 675-900 m,

Skutch 4821 (US, NY, A), 4932 (US, NY, A).

Hacienda Valverde a Orosi, El. 1200 m, photo of type

Pittier (Inst. fis. geog. Costa Rica 16366) (type of S. anadenum).

Suese, canton San Carlos, prov. Alajuela, El. 975 m,

Austin Smith 1666 (GH).

Jimenez - Santa Clara, Cooper 10201 (US, US).

Vicinity of Tilaran, prov. Guanacaste, El. 500-650 m,

Standley & Valerio 44931 (US).

Quebrada Serena, southeast of Tilaran, prov. Guana-

caste, El. 700 m, Standley & Valerio 46236 (US).

GUATEMALA:

Entre Rios, Kuyler 8891 (US).

Finca Porvenir, on Portrero Matasan along Rio Cabus,

Volcan Tajumulco, El. 1000-1300 m, Steyermark 37644 (A).

CHIAPAS:

Tvrquia, Escuintla, Matuda s.n. (GH).

3. SAPIUM LAUROCERASUS Desfontaines

Catalogus Plantarum Horti Regii Parisiensis, Ed. 3, 411.

- 1829; Urban, Symb. Antill. 3: 307. 1902; 4: 351. 1905;
 Huber in Bull. Herb. Boiss. 2, 6: 347, f. 1. 1906;
 Hemsley in Hook. Icon. Pl. 29, tab. 2888. 1909; Pax et
 K. Hoffm., Pflanzr. 52: 205. 1912.
Sapium laurocerasus var. genuinum Mull. Arg. in Linnaea
 32: 116. 1863.
Excoecaria laurocerasus var. genuina Mull. Arg. in DC.
 Prodr. 15, 2: 1202. 1866.
Stillingia laurocerasus Baill., Etud. gen. Euphorb. 513,
 tab. 6, f. 1-9. 1858.

Typus: Hortus Parisiensi Caldario, n.v.

Distribution: Endemic to Porto Rico.

The nervature poorly depicted in Hemsley's illustration.
 Huber's is more correct.

Specimens Examined:

PORTO RICO:

- Adjuntas, in Monte Guilarte, Sintenis 4554 (US, NY,
 GH).
 Between Arecibo and Utuado, Britton & Cowell 2061
 (US, NY).
 Mun. de Villalba, Toro Negro forest, El. 950-970 m,
Webster, Ellis, Miller 8740 (US).
 Coanzo to Caguas, Britton & Cowell 1399 (NY, US).
 Roadside near Caguas, Britton & Cowell 1399 (US).
 Sierra de Yabucoa, in Monte Cerro Gordo, Sintenis
 2574 (US).
 Sierra de Naguabo, Rio Icaco and adjacent hills, El.
 465-720 m, Shafer 3493 (US, NY).
 Sierra de Naguabo, Barrio de Mairales, Britton &
Shafer 2138 (US, NY).
 Catalina-Yunque Trail, Luquillo Mt., Britton & Bruner
 7558 (NY).
 El Yunque, Sargent 338 (US).
 Bosque National del Caribe, Luquillo Forest, El. 500-
 600 m, Webster, Purcell 8677 (US).
 Sierra de Luquillo, Eggers 977 (W), 1213 (US).
 Sierra de Luquillo, in Monte Jimenez, Sintenis 1659
 (US).
 Los Tres Picachos, El. 1000 m, Sargent 3064 (US).
 Cultiv. Hortus Schonbrunnensis, Hb. Jacquin, Hb.
Fenzl, Hb. Endlicher, Hb. Radlkofer (W), Horn 83
 (NY).
 Luquillo Mts., Holdridge 211 (A).
 Sierra de Luquillo, in Monte Jimenez, Urban 1659
 (GH, US).
 Luquillo Forest, Schubert & Winters 405 (GH).
 Near Cerro Punta Toro Negro, El. 3500 ft., Little
 13674 (A).
 Adjuntas in Monte Guilarte, Urban 2574 (GH, US),
Urban 4554 (US, GH, NY).

4. SAPIUM AUCUPARIUM Jacquin

Select. Amer. Hist. 249, pl. 158. 1763 excl. syn., et excl. Jacq. Enum. 1760; Swartz, Adnot. Bot. 63. 1829; Huber in Bull. Herb. Boiss. 2, 6: 358, f. 19. 1906; Hemsley in Hook. Icon. Pl. 29, tab. 2895. 1909 non Hemsley in Hook. Icon. Pl. Vol. 27, tab. 2650. 1900 quoad est S. hemsleyanum Huber; Pax & K. Hoffm., Pflanzr. 52: 230. 1912 excl. syn. Jacq. Enum. 1760.

Sapium salicifolium H.B.K. Nov. Gen. & Sp. 2: 52. 1817.

Sapium moritzianum Kl. in Seeman. Bot. Voy. Herald 100. 1852.

Sapium giganteum Pittier, Contrib. U.S. Nat. Herb. 20: 128. 1918.

Sapium aucuparium moritzianum Pittier, l.c.

Sapium caudatum Pittier, l.c. 127.

Sapium biglandulosum var. moritzianum Mull. Arg. in Linnaea 32: 119. 1863.

Sapium biglandulosum Croiz. in Jour. Arn. Arb. 24: 175. 1943 non (L.) Mull. Arg.

Excoecaria biglandulosa var. moritziana Mull. Arg. in DC. Prodr. 15, 2: 1206. 1865.

Stillingia haematantha Standl., Ann. Mo. Bot. Gdn. 27: 314. 1940.

Typus: Pl. 158 in Select. Amer. Hist. 249. 1763, growing near Cartagena in Colombia: "inque ipso suburbio Xiximani ante macellum."

Distribution: Colombia: Magdalena Valley; Panama, Honduras.

Specimens Examined:

PANAMA:

Vicinity of El Llano, Ducke 5838 (GH).

Fato (Nombre de Dios), prov. Colon, at sea level,

Pittier 4441 (US) type of S. giganteum.

Around Gamboa, Canal Zone, Pittier 3713 (US) type of

S. caudatum, El. 20-100 m, Pittier 2603 (GH, NY).

Ft. Sherman, area west of Limon Bay, Gatun Locks & Gatun Lake, Johnston 1575 (A, A).

Prov. Coclé, north rim of El Valle, Allen 1915 (US) type of Stillingia haematantha Standl.

Prov. Coclé, Aguadulce, Pittier 4951 (NY).

Prov. Los Santos, Las Takulas, Dwyer 2495 (US).

Pena Prieta, Pittier 4070 (GH, NY).

Canal Zone, one mile below Chilibi, growing on finca of Manuel Hill, Seibert 1514 (NY).

Vicinity of Concepcion, El. 100 m, Chirique, Allen 3475 (GH, NY).

HONDURAS:

Rio Lizapa, betw. Galeras and Lizapa Grande, Dpt.

El Paraizo, El. 1000 m, Molina 189 (GH).

Rio de la Orilla, Cerra Majicoran, Dpt. Morazan,

El. 850 m, Louis O. Williams 18855 (US).

Along Chorrera River drainage of Rio Yeguas 87°14',

Dpt. Morazan, El. 2600 ft., Glassman 1816 (NY).

Remarks on Nomenclature:

The name S. aucuparium published in Select. Amer. Hist. 249, pl. 158. 1763, is accompanied by a detailed description, by a good illustration and by an exact statement of occurrence at Carthagena, Colombia. The plant Jacquin described in 1763 was a living plant he saw with his own eyes.

One must, however, ignore the four synonyms: Browne. jam. 1 p. 338; Linn. sp. pl. 2 p. 1191; Plum. Ic. 171. f. 2; Fluk. alm. 369. t. 229. f. 8. Each of these represent a different species in modern sense. But Jacquin followed Linnaeus in his excessive liberality in ascribing synonyms. Sapium aucuparium Jacquin 1763 is narrowly defined and well circumscribed and leaves little chance for confusion.

The confusion began when some authors eager to follow strict priority tried to revive Jacquin's earlier (1760) publication of the epithet. The protologue of this earlier publication is inadequate for typification or identification. It lacks description, illustration or geographic reference. As a matter of fact the entire protologue consists of nothing but two synonyms: "Plum. Ic. 171. f. 2" and "Browne Jam. p. 338." They both are quite clear and adequate in themselves but definitely represent two entirely different species. Browne Jam. p. 338 probably represents S. jamaicense Sw. (1829), but the illustration Plum. Ic. 171. f. 2 with its single terminal spike, camptodrom widely spaced nervature, and conspicuous petiolar glands, excludes all possibility of identifying it with S. jamaicense, which is characterized by clustered spikes, obsolete or missing petiolar glands, and dense almost rectangular nervature.

Jacquin's loose quotation of these contradictory synonyms have no value for identification and his 1760 publication must be considered invalid.

I do not agree with Croizat (Jour. Arn. Arb. 24: 274. 1943) that Jacquin's 1763 and 1760 publications applied to two "very different plants". Nobody is in a position to know what plant - if any - Jacquin had seen or had in mind when preparing his Caribbean catalog in 1760. The difference is not in the plants he saw in 1763 and did not see in 1760, but in the validity of the two publications.

The concept of Jacquin's species was correctly interpreted by Swartz as early as 1829 ("descriptio Jacquini optima"). All botanists treating Sapium monographically accepted this interpretation: Muller Argoviensis (1863), Huber (1906), Hemsley (1908), Pax & K. Hoffman (1912), Bro. Alain (1953).

My search in Jacquin's herbarium in Vienna revealed no specimen collected by him in Carthagena, and S. aucuparium Jacquin 1763 for the time being must be typified by his illustration (tab. 158).

5. SAPIUM THELOCARPUM Schuman & Pittier

In Contrib. U.S. Nat. Herb. 12: 166, tab. 13. 1908.

Typus: Hedges at La Verbena near San Jose, El. 1100 m, Costa Rica, Tonduz 8857 (US, US)!

Specimens Examined:

COSTA RICA:

Along R. Ciruelas on the southern slope of Barba Volcano, El. 1800 m, Tonduz 2219 (NY).

Hacienda Tourmon, San Francisco de Guadalupe, El. 1200 m, Pittier 3669 (US, US).

Potrero, San Francisco Guadalupe, Jimenez 12 (US).

Dans une cafeerie pres de la station de San Juan, Tonduz 17558 (US).

Au bord du rio Nizilla pres San Juan, Tonduz 17559 (US).

Vicinity Palmar Sur de Osa, prov. Puntarenas, Allen 5567 (US).

Environ de Nicoya, Tonduz 1900 (US).

HONDURAS:

Edge of Lake Yojoa, Howard, Briggs, Kamb, Lane, Ritland 623 (NY).

NICARAGUA:

Casa Colorada and vicinity, south of Managua, El. about 850 m, Maxon, Harvey, Valentine 7460 (US).

6. SAPIUM BOURGEAUI Croiz.

In Jour. Arn. Arb. 24: 172. 1943.

Typus: Santa Ana near Orizaba, Vera Cruz, Mexico, M. Bourgeau 3010 (A). Type.

Based on a sterile specimen. Without flowers and some doubtful loose capsules, it was impossible to distinguish it definitely from S. aucuparium or S. thelocarpum. Hemsley reported a duplicate of the same collection in the notes under S. mexicanum in Hook. Ic. Vol. 27, pl. 2680. 1901, but he abstained from describing it because of the inadequate specimen.

Another inadequate specimen is found in the Vienna herbarium: Mexico, prov. Mirador, Vera Cruz, El. 3000-3800 ft., Hohenacker s.n., with shorter leaves (9 cm long, 3-5 cm wide), otherwise undistinguishable from Bourgeau 3020.

7. SAPIUM OLIGONEURUM Schuman & Pittier

In Contrib. U.S. Nat. Herb. 12: 168, tab. 17. 1908; Pax et K. Hoffm., Pflanzr. 52: 231. 1912.

Sapium sulciferum Pittier, l.c. 169; Hemsll., Hook: Icon. Pl. 29, tab. 2892. 1909.

Sapium schippii Croiz., Am. Midl. Natur. 29: 477. 1943.

Sapium biglandulosum var. Klotzschianum Mull. Arg. in Linn. 32: 117. 1863.

Sapium biglandulosum var. oligoneurum Monachino in Bull. Torrey Bot. Club 67: 772. 1940.

Sapium biglandulosum var. sulciferum Monachino l.c.

Typus: Costa Rica: Along upper road going from the railroad station at Cartago to Cot, near San Rafael, El. 1500 m, H.

Pittier (Inst. fis. geog. Costa Rica, no. 13403; U.S. Nat. Herb. no. 578903). Type.

Distribution: Costa Rica, Panama, Nicaragua, Honduras, El Salvador, Br. Honduras, Guatemala, Mexico (Chiapas).

Specimens Examined:

COSTA RICA:

La Hondura (San Jose), El. 1300-1700 m, Standley 37623 (US).

La Palma, Bord de la route de la Palma, Tonduz 12428 (US), El. 1550 m. Typus of S. sulciferum. (Holotype NY).

La Palma, au pied des troncs a la Palma, Tonduz 12428 (US), El. 1459 m.

Road above San Isidro de Coronado, Allen 542 (A), El. 1400-1600 m.

San Francisco Guadalupe, Jimenez 639 (US).

San Francisco de Guadalupe, El. 1200 m, Pittier 3670 (US, US).

Los Cuadros near Guadalupe, El. 1200 m, Pittier 3690 (legit Jimenez) (US).

La Palma de San Ramon, Brenes 5525 (NY).

Rio Maria Aquilar near San Jose, El. 1200 m, Standley 38938 (US).

La Carpintera, El. 1400-1500 m, pr. Cartago, Pittier 3668 (US).

Cartago, El. 4500, Cooper 5940, 265 (US).

Along River Reventado, north of Cartago, Standley & Valerio 49418, 49542 (US, US).

Cartago vicinity, Stork 335 (US).

San Rafael de Cartago, El. 1500 m, Pittier 13403 (US). Typus of S. oligoneurum.

Alajuela, Canton Alfaio Ruiz, El Selaneia, El. 1400 m, Austin Smith P 2294 (A).

Regione Pacifica, peninsula Osa, and Golfo Dulce circa Puerto Jimenez, ad vias arbor 8 m, Cufodontis s.n. (Oesterr Costa Rica Exped. 1930 unter leitung Prof. Porsch (W)).

PANAMA:

Boguelli, prov. Chiriqui, El. 4000 ft., Davidson 852 (A).

HONDURAS:

In forested lower slopes of Mt. Cangregal vicinity of La Ceiba, Dpt. Atlantido, Yunker, Koepper, Wagner 8511 (US, NY, GH).

Zamorano, Dpt. Morozan, El. 800 m, Williams, Molina 12687 (GH).

BR. HONDURAS:

"Forest Home". Punta Gorda, El. 250 ft., W. A. Schipp 1049 (A, NY, GH). Typus of S. schippii Croiz.

GUATEMALA:

Arroyo (Rio) Petexbatum, south of Sayaxche, El. 50 m,

Steyermark 46185 (US, A).

San Jose, Frederichstal 1315 (W, A).

Huehuetenango, Cafetal of Finca Soledad, 5 miles
southeast of Barillas, Sierra de los Cuchumatanes,
El. 1150 m, Steyermark 49527 (A).

CHIAPAS

En Canada hacia el Aguacate al N de La Chacoma hacia
800 m de alt., Faustino Miranda 6414 (US).

NICARAGUA:

Mombacho Volcano, El. 750-900 m, Maxon, Harvey, Valen-
tine 7806 (US, GH).

EL SALVADOR:

Laguna de las Ranas, on hill west of Cerro del Aguila,
lat. 13°54' N. Long. 88 44 W, El. 1680 m, Dpt. St.
Ana, Tucker 1244 (NY, US).

A comparatively large collection is available from Costa Rica from the vicinity of San Jose. These specimens (15 of them) show a great variation of the apex of the leaves from strong cucullate to unguiform and plane. The leaf is, however, quite constantly elliptic and short and the fruit is slightly stalked.

Specimens collected at a greater distance from San Jose show often a departure from this leaf shape, which often gets more lanceolate.

The specimen collected by Steyermark at Petexbatum, Guatemala is very distinct with its large leaves and is very possibly a new species, but lack of flower and fruit does not permit a description. The specimen from Chiapas is also sterile and shows a peculiar double anastomosing venation.

8. SAPIUM DAPHNOIDES Griseb.

In Nachr. Gesellsch. Gottingen 176. 1865; Huber in Bull.
Herb. Boiss. 2,6: 349, f. 4. 1906; Pax et K. Hoffm.,
Pflanzr. 52: 205. 1912; Bro. Alain, Fl. de Cuba 3: 113.
1958.

Excoecaria biglandulosa var. daphnoides Mull. Arg. in DC.
Prodr. 15,2: 1205. 1866.

Typus: Cuba, Wright 2001 (Isotype in US)!

Distribution: Endemic to Cuba.

Specimens Examined:

CUBA:

Pinar del Rio: On hill Soroa, Candelaria, Bro. Alain
2446 (NY, GH).

Las Villas: Sto. Tomas, Cienaga de Zapota, Acuna 4344
(NY).

Las Villas: Sta. Clara, Lomas de Banao, Luna 111 (NY).

Oriente: Stjago de Cuba, Roig 6825 (NY).

Oriente: Sierra Maestra, Ekman 14420 (US, NY).

Oriente: Slope of main peak of Pico Turquino, Rucher

85 (NY).

Oriente: Pico Turquino, Bro. Leon 10797 (NY).

9. SAPIUM HIPPOMANE G.F.W. Meyer

Prim. Fl. Esseq. 275. 1818; Urb. Symb. Antill. 3: 305.

1902; Pax et K. Hoffm., Pflanzr. 52: 251. 1912.

Sapium suberosum Mull. Arg. in Linnaea 34: 217. 1865.Sapium fendleri Hemsley in Hook. Icon. Pl. 29, tab.
2888. 1909.Sapium biglandulosum var. meyerianum Mull. Arg. in
Linnaea 32: 116. 1863.Excoecaria biglandulosa var. hippomane Mull. Arg. in DC.
Prodr. 1204. 1865.Sapium glandulosum Croizat in Jour. Arn. Arb. 24: 176.
1943. non MorongTypus: British Guiana: In humidis insulae Arowabish,
Hostmann 314 (vidi in hb. Vindob).Distribution: British Guiana, Suriname, Barbados, Trinidad,
Tobago.

Specimens Examined:

TRINIDAD:

Collector's name(?) 2467 (US, NY). Broadway 5203 (NY).

TOBAGO:

Louis d'Or near the river, Broadway 4527 (GH, US).Roxborough - Bloody Bay Road, El. 1000 ft., Purse-
glove 6326 (US).

BARBADOS:

Forster Hall Wood, Eggers 7238 (NY, A, US).Turner's Hall Wood, El. 200 m, Beard & Hauschell 623
(A).Newcastle Wood, St. John, Lash 187 (US, NY).Dodds, Bovell 187 (NY).St. John, St. Margaret's Woods, Gooding 427b (NY).Meyer has compared this species with Sapium jamaicense,
stating: "A Sapium jamaicensi diversum. Folliis apice rostro
parvo subcartilagineo crasso introrsum flexo auctis."We can distinguish two forms of S. hippomane, one with
lanceolate leaves found in Trinidad and Tobago, and another
with elliptic broad leaves in Barbados.

10. SAPIUM BUCHII Urban

Arkiv. Bot. 20A, 15: 65. 1926.

Sebastiana buchii Urb. Nbl. B. G. Berlin 7: 497. 1921.Typus: Montagne noire in partibus montosis, El. 1800 m,
Buch 1673 n.v.

Distribution: Endemic to Hispaniola.

Specimens Examined:

HAITI:

Massif de Bahos, gr. Las Cahobas, Belladere, Morne Lagoune-Ibere, laterite on limestone, El. 1200 m, Ekman H 5605 (US).

Massif de la Selle, Petionville, M. Tranchant, El. 1675 m, Ekman H 1185 (US, NY).

Massif du Nord, Port de Paix, Haut Piton, El. 1100 m, Ekman H 9820 (US, A).

Barana, Petite Source, Morne des Commissaires, El. 1520 m, Holdridge 1934 (US, GH, NY).

SANTO DOMINGO:

Cordillera Septentrional, prov. Santiago, Loma Diego de Ocampo, El. 900 m, Ekman H 16299 (US).

The majority of collections are characterized by elliptic leaves (4.5-6 x 2 cm). Two collections: Holdridge 1934 and Ekman H 5605 differ from the rest by narrow lanceolate leaves (7-9 x 1-1.5 cm).

Specimens examined by Bro. Alain (personal inf.):

HAITI:

Petit Goave, Ekman 6584 (S).

Las Cahobas, Ekman 5605 (S).

Perodin, Ekman 3455 (S).

St. Michel de Atalaye, Ekman 8377 (S), 8367 (S).

Montagnes Noires (typus) Buch 1673 (S).

Morne Tranchant, Ekman 1185 (S).

Port de Paix, Ekman 9820 (S).

Morne des Commissaires, Holdridge 1934 (S).

SANTO DOMINGO:

Diego de Ocampo, Cape Samana, Ekman 14899 (S).

Very narrow leaves.

11. SAPIUM CARIBAEUM Urban

Symb. Antill. 3: 308. 1902; Huber in Bull. Herb. Boiss. 2, 6: 349, f. 3. 1906.

Sapium glandulosum Croizat, Jour. Arn. Arb. 24: 176. 1943, non Morong.

Excoecaria biglandulosa var. leptadenia Glaziou in Bull. Soc. Bot. France 59 Mem. 3g. 635. 1912.

Hippomane glandulosa L., Spec. ed. 1: 1191. 1753 (quoad syn. Plum).

Hippomane biglandulosa L., Spec. ed. 2: 1431. 1763 (quoad. syn. Plum).

Typus: In Guadalupe in regione inferiore et media usque ad 1000 m alt. e. gr. in sylvis Bains Jaunes Trois Rivières, Duss 2932 (syntype in NY).

Distribution: Lesser Antilles.

Specimens Examined:

ST. JAN:

Cinnamon Bay Gut, Eggers s.n. (GH).

ST. KITTS:

Lambert Estate, Britton & Cowell 645 (US, NY).

ANTIGUA:

Christian Valley, Harold E. Box 1181 (US, NY, A).

GUADALUPE:

In silvis Bains-Jaunes, Duss 2932 (NY, US, GH, NY).

Saut du Constantin, Questel 5108 (US).

Matouba, Questel 2087 (US).

Basse-Terre, la Soufriere, above St. Claude foret de

Bains-Jaunes, El. 800-1000 m, Webster, Ellis,

Miller 9102 (US).

DOMINICA:

Carib trail from Salybia to Hutton Garden, Hodge 3362 (GH).

Height above Magua (near Bellevue), Douglas Taylor 133 (GH).

MARTINIQUE:

Grand bois de Fond St. Denis, de Champflore de 1'

Ajoupa Bouillon, Pere Duss 29 (NY, NY, US).

Bois de Sainte Luce, Hahn 882 (US, V).

STA. LUCIA:

En bas saut, tran masse-river, El. 300 m, John S. Beard 504 (A, NY).

En bas saut, Pamela Beard 1092 (GH, US).

M. Deux Boltes (Canaries), Harold E. Box 1882 (NY).

ST. VINCENT:

Umdwas and Lennard, El. 1500-2000 ft., G.H. Smith 492 (GH, NY).

12. SAPIUM MACROCARPUM Mull. Arg.

In Linnaea 32: 119. 1863; Huber in Bull. Herb. Boiss.

2,6: 352, f. 8. 1906; Pax et K. Hoffm., Pflanzr. 52: 204. 1912.

Sapium mexicanum Hemsley in Hooker Ic. Pl. Vol. 27, tab. 2680. 1901.

Excoecaria macrocarpa Mull. Arg. in DC. Prodr. 152: 1207. 1861.

Typus: Hb. Pavon in Hb. Boissier, NE (Nueva Espana).

A Mull. Arg. sphalmate perperam ex Peruvia notatus.

Distribution: Mexico (Morelos, Colima, Chiapas) and Guatemala.

Specimens Examined:

COLIMA:

16 miles W-NW of Santiago, road to Cihuatla, El.

30 m, McVaugh 14984 (US).

MORELOS:

- Cuernavaca, El. 5000 ft., Pringle 6336 (A, GH, NY, US, W). Type of S. mexicanum Hemsley.
Cuernavaca, El. 5000 ft., Pringle 13195 (US).
Cuernavaca, Knechtal 674 (W).
Cuernavaca, Holway 3517 (GH).
Cuernavaca, Orcutt 3893 (US).
Cuernavaca, Schmitz 1122 (W, W).

CHIAPAS:

- ACD de Tonalá, en el camino a Arrioga, Miranda 7279 (US).

GUATEMALA:

- Jutiapa, Louis D. Williams 14207 (GH).

13. SAPIUM PACHYSTACHYS Schuman & Pittier

- In Contrib. U.S. Nat. Herb. 12: 168, tab. 16, 1908; Pax et K. Hoffm., Pflanzr. 52: 231. 1912.

Typus: Costa Rica: El Copey, Dota Mt., El. 1800 m, Ad. Tonduz 11875 (US, US, NY)!

Distribution: Costa Rica, Nicaragua, Panama.

Specimens Examined:

NICARAGUA:

- Ameyá, Dpt. Chinandega, near sea level, Maxon, Harvey, Valentine 7186 (US).

COSTA RICA:

- Vara Blanca de Sarapiquí, north slope of Central Cordillera, between Poas and Barba Volcano, El. 1740 m, Skutch 3384 (A, US, NY).
La Palma, Prov. of San José, El. 1600 m, Standley 38012 (US).
Quebradillas, 7 km N of Santa María de Dota, Prov. San José, El. 1800 m, Standley 42936 (US).
Near summit of Cerros de Escazu, about 10 km SW of San José, El. 7100 ft., Little 6042 (US).
La Palma, Jimenez 959 (US).

PANAMA:

- Chiriquí, slopes of Volcan Baru, near town of Cerro Punta, El. 6300 ft., Stern & Chambers 97 (US).

14. SAPIUM PEDICELLATUM Huber

- In Bull. Herb. Boiss., Ser. 2, 6: 352, f. 9. 1906;
Pittier in Contrib. U.S. Nat. Herb. 12: 166, tab. 11. 1908; Hemsley in Hook. Icon. Pl. 29, tab. 2893. 1909;
Pax et K. Hoffm., Pflanzr. 52: 253. 1912.

Typus: Stillingia arborea Pavon in Sched. Vidi in hb. Boiss.

- Syn.: S. biglandulosum var. klotzschianum f. oblongatum Mull. Arg. in Linnaea 32: 117. 1863.

S. biglandulosum var. hamatum f. pavonianum Mull.
Arg. l.c. Perperam ex Peruvia citatum. Vidi in
hb. Pavon in hb. Boiss.

Distribution: Disjunct, Pacific slopes of Mexico
between the Tropic of Cancer and Guerrero, and also in El
Salvador and Honduras, with a big gap betw. Guerrero and El
Salvador.

Specimens Examined:

Photograph made in Br. Mus. (coll. Sesse &
Mocino) Stillingia arborea Ruiz & Pavon "N.E." (NY).

SINALOA:

La Ramada, Ortega 4492 (US).
Culiacan, Yuale, Palmer 1451 (GH, GH, US, US).
San Juan, Ortega 4025 (US).
Near Colomos, foothills of S. Madre, Rose 1783
(US).
Labradas, Ferris & Mexia 5263 (A).

NAYARIT:

Vicinity of San Blas, Ferris 5372 (US), 5468
(US).
Puga-Tepic, Ferris 5802 (US, A).
Tepic, Collino, Kempton 74 (US), 25 (US).
Acaponeta, Rose 1473 (US, GH).
Acaponeta, Rose, Standley, Russell 14434 (NY).

JALISCO:

Puerto Vallarta, Howell 10313 (A).
Dry arroyo 3 miles west of Autlan c. 3200 ft.
alt., Wilbur, Wilbur 1653 (US).
Trail between Chaute and Mamatlan about 15
miles south-southeast of Autlan, Wilbur
2109 (US).

COLIMA:

Near Colima, Palmer 92 (US, US, US, US, US,
GH).
Extreme western end of Bahia de Santiago,
opposite Santiago, between the gravelly
ocean beach and coastal lagoon, McVaugh
15870 (US).

GUERRERO:

Distr. Galeana, Atoyac 25-100 m, edge of
arroyo, Hinton 15448 (NY), 14548 (GH, US,
W).

EL SALVADOR:

San Martin, Calderon 708 (NY, US).
Finca San Nicolas, Choussy 1580 (US, NY, GH).
Vicinity Apopa, Dpt. San Salvador, Allen &
Armour 6849 (US).
Laguna del Jocotal, Dpt. San Miguel, Allen &
Severin 6888 (NY, US).
Vicinity of San Salvador, El. 650-850 m,

Standley 22436 (NY, US, GH).

Vicinity of La Union, Dpt. La Union, El. 150
m or less, Standley 20819 (US, GH).

Vicinity of San Vicente, Dpt. San Vicente,
El. 350-500 m, Standley 21721 (US).

HONDURAS:

Vicinity of Tela, Dpt. Atlantida at sea level,
Standley 54221 (A, US).

15. SAPIUM LATERIFLORUM Hemsl.

In Hook. Icon. Pl. Vol. 27, tab. 2680. 1901.

Typus: Primeval forest of Famulte, Tabasco, Mexico,
Rovirosa 769 (K), isotype (US!).

Distribution: Mexico (Sinaloa, Nayarit, Colima, Oaxaca,
Vera Cruz, Tabasco, Chiapas), Br. Honduras, Guatemala, Honduras,
Costa Rica.

Specimens Examined:

SINALOA:

Pueblo de San Juan, San Ignacio, El. 300 m, Montes,
Salazar 360 (sterile US).

NAYARIT:

Vicinity of Acaponeta, dry hills, Rosa, Standley,
Russell 14434 (sterile US).

COLIMA:

Palmer 1186 (sterile US).

OAXACA:

Cerro Espino, El. 600 m, Cafetal Concordia, B.P.
Reko 3595 (with frts. US).

VERA CRUZ:

Misantla, Purpus 5967 (US, GH, NY).

Entre Yecuatla y Colipa, El Caobal a 3 km el ono de
Colonia Deesa, Martinez 50-4 (A).

3 km de Martinez de la Torre rumbo a Misantla,
Gomez Pompa 904 (A).

Vera Cruz, Fred Muller 34 (NY, NY).

Coacacoalcos, Fortuno, Williams 8717 (US).

TABASCO:

Forest of Famulte, Rovirosa 769 (type).

CHIAPAS:

Cerca de Ocosingo, El. 850 m, Miranda 7206 (US).

GUATEMALA:

Dept. Alta Verapaz, Tucuru, El. 350 m, Turckheim
2229 (NY, US).

Dept. Alta Verapaz, Cerro de Agua Tortuga (Sahaoc)
vicinity of Cubilguitz, El. 350-450 m, Steyer-
mark 44633 (A).

Dept. Guatemala, along slopes of Lago de Amatitlan
below Moran, El. 1300 m, Steyermark 52146 (A).

Dept. Isabel, vicinity of Quirigua, El. 75-
225 m, Standley 24608 (US, NY, GH).

BR. HONDURAS:

El Cayo district, camp 6, Gentle 2590 (A).

Honey Camp, Orange Walk, Lundell s.n.

(sterile NY, US, US, US, A).

HONDURAS:

Lancetilla Valley, near Tela, Dept.

Atlantida, El. 20-600 m, Standley 55288 (A).

COSTA RICA:

Hacienda Tournon, San Francisco de Guadalupe,
Pittier 3670 (US).

Specimens collected on the Mexican west coast may represent a new species with larger leaves (13-24 cm) and more pronounced petiolar glands, but the material is poor.

16. *SAPIUM NITIDUM* (Monachino) Lundell

Am. Midl. Nat. 29: 477. 1943.

Sapium biglandulosum var. nitidum Monachino, Bull. Torr.

Bot. Club 67: 771. 1920.

Typus: British Honduras, on deep river-alluvium, Santa Rosa pasture, 2 miles from El Cayo, El. 65 m, J.B. Kinloch 340 (typus in NY, US).

Monachino thought that treating this plant as a variety instead of species is a more "modest" procedure. However, it creates the impression that one is able to precisely measure the degree of relationship, which is very far from the truth, especially in this difficult genus. Besides, I cannot distinguish S. nitidum from S. lateriflorum except by the number of locules of the capsules. Since very few specimens of S. lateriflorum have complete material, it is difficult at this time to be sure if there are two species or only one.

17. *SAPIUM RUIZII* Hemsley

In Hook. Icon. Pl. 29, tab. 2894. 1909.

Typus: "Nova Hispania" (Mexico vel America Centralis).

Ruiz & Pavon s.n. (BM).

Species mihi tantum ex fotogr. nota.

18. *SAPIUM CUNEATUM* Griseb.

Fl. British West Ind. Isl. 49. 1864; Pax et K. Hoffm.,
Pflanzer. 52: 235. 1912.

Excoecaria cuneata Mull. Arg. in DC. Prodr. 15, 2: 1208.
1865.

Typus: "Jamaica 1850, R. C. Alexander" (vidi syntype in NY). Fide Pax: St. Ann parish: Moneague.

Distribution: Endemic to Jamaica.

Specimens Examined:

JAMAICA:

- Trelawny parish, Cockpit country, c. 3 miles N of
Troy woods on limestone, El. 1500-1780 ft.,
Webster, Ellis, Miller 8400 (fem. US).
Potsdam Woodlands, Santa Cruz Mts., El. 2600 ft.,
Harris 9817 (male US, sterile NY).
Manchester parish, collector? (GH).
Manchester parish, upper slopes and summit of
Herons Hill (Shooler or Martin Hill), El. 3000-
3100 ft., Proctor 17476 (A) frt.
Manchester parish, 2 miles from Mandeville on old
road to Spur Tree, Howard & Proctor 14567 (A).
Clarendon parish, Crofts Mountain, El. 2500 ft.,
Harris 11214 (NY, US).
Dolphin Head and vicinity, El. 450 m, Britton 2290
(sterile NY).
Clarendon parish, 10 miles southwest of Priestmans
River, El. 1500-2500 ft., Proctor 5254 (A).

19. SAPIUM HARRISII Pax et K. Hoffm.

In Pflanzr. 52: 236. 1912.

Typus: Jamaica, Hardware Gap, El. 4000 ft., Harris 10117 (isotypes NY, US, GH).

Distribution: Known only from the type locality, Hardware Gap, Portland parish, Jamaica.

Specimens Examined:

JAMAICA:

- Vicinity of New Castle, Hardware Gap, Britton, Hollick 1794 (fem. NY).
Along the waterfall track north of Hardware Gap,
El. 3900-4000 ft., Proctor 22072 (GH), 24649 (GH).
Jamaica, March 1819. Collector(?) (GH).

Hardly different from S. cuneatum. The difference is supposed to be in the longer stylar column. The available material is not enough to evaluate this character.

20. SAPIUM LEUCOGYNUM Wright ex Grisebach

- In Nachr. Ges. Wiss. Göttingen 176. 1865; Urban, Symb.
Antill. 3: 310. 1902; Huber in Bull. Herb. Boiss.
2,6: 350, f. 5. 1906; Pax et K. Hoffm., Pflanzr. 52:
218. 1912; Bro. Alain, Fl. de Cuba 3: 114. 1953.
Sapium leucospermum Griseb. in Nachr. Ges. Wiss.
Göttingen 177. 1865.
Excoecaria leucogyna Mull. Arg. in DC. Prodr. 15,2:
1208. 1866.
Excoecaria leucosperma Mull. Arg. in DC. Prodr. 15,2:
1209. 1866.

Typus: Cuba: Pinar del Rio, Retiro, Wright 2000 (isotypes GH, NY, US).

Distribution: Endemic in western Cuba on limestone hills.

Specimens Examined:

CUBA:

Pinar del Rio: Retiro, Wright 2000 (GH, NY, US).
Limestone hills, vicinity of Sumidero,
Shafer 13460 (NY, NY), 13728 (NY,
NY).

Sierra Guayaba, south of Sumidero,
Shafer 13859 (US, NY, NY).

Rangel, limestone cliffs, Bro. Alain
1174 (NY).

Rangel, Loma del Sabicu, Bro. Leon
12624 (NY).

Banos San Vicente, Britton, Britton,
Gager 7455 (NY, US).

San Cristobal, Loma del Pimiento,
Ekman 11530 (NY).

Rangel, on 1st. rocks, El. 500 m,
Bro. Alain 612 (GH), 114085 (GH).

Sierra de Anafe, Bro. Leon 11476 (NY),
11546 (NY, NY).

Sierra de Anafe, 1st. rocks, shady
places, Bro. Alain 5309 (GH).

Las Villas: Trinidad Mts., Pico Portrerillo, El.
1000 m, Bro. Alain 6342 (US, GH).

Trinidad Mts., La Guira, Tope de
Collantes, El. 900 m, Bro. Alain
6480 (GH).

21. SAPIUM HAITIENSE Urban

In Arkiv. for Botanik 17,7: 39. 1921.

Typus: Haiti, "Morne de la Hotte in declivibus sept.-orient. in sylvis montanis satis frequens, ca 800 m alt."
Ekman 207 n.v.

Distribution: Endemic in massif de la Hotte of Haiti.

Specimens Examined:

Massif de la Hotte, western group, Les Roseaux,
virgin forest near Quilland, mountain top ca 1500 m,
Ekman 10140 (US, NY),

Specimens examined by Bro. Alain (personal inf.):

HAITI:

Morne la Hotte (typus) Ekman H 207 (S).

Ma Blanche, Ekman 624 (S).

Les Roseaux, Ekman 10140 (S).

Torbec, Ekman 5321 (S).

22. SAPIUM ADENODON Griseb.

In Mem. Amer. Acad. 2 ser. 8: 160. 1860; Pax et K.
Hoffm., Pflanzr. 52: 236. 1912; Alain, Fl. de Cuba
3: 115. 1953.

Excoecaria eglandulosa Mull. Arg. in DC. Prodr. 15,2:
1209. 1866.

Bonania adenodon Benth. in Benth. & Hook. f. Gen. 3:
335. 1880.

Typus: "Cuba Orientali, prope villam Monte Verde dictam,"
C. Wright 1428 (isotypes: GH, A, NY).

Distribution: Endemic Cuba Oriente.

Specimens Examined:

CUBA:

Monte Verde, C. Wright 1428.

Pinelands, Pena Prieta, Toa, El. 600 m, Bro. Alain 3203 (GH).

Baracoa Region, mesa de Prada, Ianco, El. 350 m,
Bro. Leon 11849 (NY).

Sierra de Nipe, Loma de Estrella, Ekman 5801 (NY).
Sierra de Nipe, Woodfred, El. 500 m, Ekman 9079
(NY).

Sierra de Nipe, Manacales at Rio Pilato, El. 350 m,
Ekman 6722 (NY).

Sierra de Nipe, Manacales at Loma Mensura, Ekman 9923 (US).

23. SAPIUM MAESTRENSE Urban

Fedde, Rep. Nov. Spec. 28: 230. 1930; Alain, Fl. de
Cuba 3: 115. 1953.

Typus: Cuba Oriente, Sierra Maestra in the northern
spur of Pico Turquino, steep rocks of Loma Regino, Ekman 14480 (NY). Seen photo only.

Distribution: Endemic in Sierra Maestra of Cuba
Oriente.

Specimens Examined:

CUBA:

Along Rio Paladero, below Aseradero, San Antonio
de los Cumbres, crest of Sierra Maestra, El.
1300 m, C.V. Morton 9560 (US).

Loma del Gato, El. 1000 m, Bro. Leon 10420 (GH).

24. SAPIUM CUBENSE Britton & Wilson

In Mem. Torrey Bot. Club 16: 77. 1920; Alain, Fl. de
Cuba 3: 115. 1953.

Typus: "Type from near woodfred, Sierra Nipe," Cuba

Oriente, Shafer 3607 (US).

Distribution: Cuba Oriente: northern Oriente and eastern Sierra Maestra.

Specimens Examined:

CUBA:

No detailed locality given. Probably near Aseradero, Sierra Maestra, Wright 1428a (US, NY).

Sierra Nipe: Near Woodfred, El. 450-550 m, Shafer 3025 (NY, US).

Sierra Nipe: Near Woodfred, El. 450-550 m, Shafer 3607 (holotypus NY, isotypus US).

Sierra Nipe: Near Woodfred, El. 450-550 m, Shafer 3609 (GH, NY).

Sierra Nipe: Near Woodfred, El. 450-550 m, Shafer 3611 (NY, GH).

Sierra Nipe: Lumber Camp, El. 600-700 m, Morton, Acuna 3203 (US).

Sierra Nipe: Loma La Bondera, Carabia 3820 (NY).

Sierra de Cristal: Valley of Lebisa River, Alain & Figueiras 4599 (GH), 4601 (GH).

Camp La Gloria, S. of Sierra Moa, Shafer 8168 (NY), 8291 (NY, US).

Moa Bay, East of Rio Moa, Shafer 8361 (NY, US).

Alluvial Valley of Rio Yamanigüey, Shafer 4216 (NY, GH, US).

Mesa de Prada, Jauco, Southern Baracoa region, Leon 11849 (GH).

Sierra Maestra: Loma del Gato, Leon, Clemente, Roca 10420 (NY).

Sierra Maestra: Loma del Gato, La Finca de los Hermanos, El. 750 m, Ekman 15683 (NY).

25. SAPIUM MOAENSE Alain

Rev. Soc. Cubano Bot. 1027. 1953; Alain, Fl. de Cuba 3: 115. 1953.

Typus: La Brena woods, Moa Region, Cuba Oriente, Bros. Leon & Clemente 23297 (NY, GH).

Distribution: Endemic to Moa Region, Cuba Oriente.

Specimens Examined:

CUBA:

Cayo Coco, vicinity of Moa, Julian Acuna 12510 (US).

26. SAPIUM PARVIFOLIUM Alain

In Contribuciones Ocasionales del Museo de Historia Natural del Colegio "De La Salle" 11: 10. 1952; Alain, Fl. de Cuba 3: 115. 1953.

Typus: Mina Cayoguan, Moa Region, Cuba Orientae, Leon &

Clemente 23163 (holotype in La Salle, Habana; isotype in NY, GH).

Distribution: Endemic to serpentine barrens of Cuba Oriente.

Specimens Examined:

CUBA:

Moa Region: Mina Cayoguan, Leon & Clemente 23163 (NY, GH).

Moa Region: Cayo Coco, Acuna 12508 (US), 12509 (US).

Moa Region: Monte La Brena, Acuna 13162 (GH).

Baracoa Region: 19 km S of Baracoa, Via Azul, Alain & Morton 5137 (US, GH).

Baracoa Region: On the Via Azul betw. Sabanilla and Cajabobo at 7 km from Sabanilla, El. 600 m, Morton & Alain 9002 (US), 9003 (US).

Sierra de Cristal: Valley of Lebissa River, Alain & Figueiras 4574 (GH), 4612 (GH).

Sierra Nipe: South of lumber camp, El. 600-700 m, Morton & Acuna 3067 (US).

27. SAPIUM ERYTHROSPERMUM (Griseb.) Mull. Arg.

In Linnaea 32: 119. 1863; Pax et K. Hoffm., Pflanzr. 52: 218. 1912; Alain, Fl. de Cuba 3: 114. 1953.

Excoecaria erythrosperma Griseb., in Mem. Amer. Acad. 2, 8: 161. 1861; Mull. Arg. in DC. Prodr. 15, 2: 1208. 1866.

Bonania erythrosperma Benth. et Hook. f. Gen. 3: 335. 1880.

Typus: La Guinea, Wright 1673 (W, GH, NY).

Distribution: Endemic to southern Cuba Oriente.

Specimens Examined:

CUBA:

La Guinea (SE Sierra Maestra), Wright 1673 (W, GH, NY).

Since flowers were not seen it was difficult to establish exact systematic position, but character of glands at the base of lamina suggests Sebastiania rather than Sapium.

28. SAPIUM PITTIERI Huber

In Bull. Herb. Boiss. 2, 6: 350, f. 7. 1906; Pittier in Contrib. U.S. Nat. Herb. 12: 167, f. 9 & f. 15. 1908; Pax et K. Hoffm., Pflanzr. 52: 208. 1912.

Sapium laurocerasus Pax in Anal. fis. geogr. nation 8: 4. 1895.

Typus: Costa Rica, western slope of La Carpintiera, between Tres Rios and Cartago at an altitude of about 1700 m,

Pittier & Tonduz 4344 (isotype US).

The nervature on f. 9 of Pittier is poorly represented. The retroflex laminal glands are strikingly similar to those of the Brazilian S. sellowianum and microdentatum.

29. SAPIUM SIMILE Hemsl.

In Hook. Icon. Pl. 29, tab. 2894. 1909.

Sapium sessile Pax nomen sphalmate false scriptum
(Pflanzr. 68: 61. 1919).

Typus: "N.E. Ruiz & Pavon" (Centr. Am. or Mexico) n.v.
Vidi tantum photo.

Note: According to Hemsley it is similar to S. ciliatum Pax, and he describes it as "folia, per totum ambitum crebre glanduloso ciliata".

30. SAPIUM SP. NOV. aff. DAPHNOIDES

Leaves elliptical, rounded on tip, plane and not cucullate, rusty brown below. Secondary nerves almost straight.

Specimens Examined:

PANAMA:

Chiriqui, slopes of Volcan Baru near town of Cerro Punta, El. 6000 ft., (sterile) W.L. Stern & K.L. Chambers 85 (A, US).

COSTA RICA:

Viento Fresco, prov. de Alajuela, El. 1600-1700 m, Paul C. Standley, Ruben Torres R. 47896 (US).

No doubt a good species, but both collections incomplete for naming and description. Also similar to S. moaense Alain of Cuba Oriente.

Nomina Confusa Atque Rejicienda

In his Species Plantarum ed. 1: 1191. 1753, Linnaeus published Hippomane glandulosa with the differential phrase name: "foliis ovato-oblongis serratis glandulosis" and included two synonyms: Plum. gen. 50 and Pluk. alm. 369. t. 229. f. 8.

These synonyms, both well illustrated, can easily be identified with two distinct species of modern usage: Sapium aucuparium Jacq. 1763 and S. caribaeum Urb. 1902, but they both also can be well absorbed into the broad Linnaean concept.

In the second edition of Species Plantarum in 1763, Linnaeus, while correcting the epithet "glandulosum" to "biglandulosum", maintained the broad concept, repeating almost unchanged the differential phrase name and adding two more synonyms: Sapium arboreum Browne jam. 338 and Sapium aucuparium Jacq. amer. 31. t. 158. The first one represents S. jamaicense Sw. of modern usage. The inclusion of the second one was not surprising either, it was well within the broad concept of

Linnaean species, which was so broad that it could easily absorb 45-50 of our modern Sapium species.

In 1863 Muller Argoviensis transferred the major portion of Hippomane biglandulosa L. to Sapium, creating Sapium biglandulosum (L.) Mull. Arg. in Linnaea 32: 116. 1863, but he also added 8 new and retained a few newly described West Indian binominals in addition to S. biglandulosum.

Realizing the heterogeneity of the old Linnaean concept Mueller began to split it up, first into 13, then into 17 in 1865, and finally into 26 in 1874, ending up with a block of 26 trinominals, 11 quadrinominals, and a few quinquenominals, all poorly defined and many of them based on one meager specimen only. The hierarchy thus created made the false impression of a perfect taxonomic coordination, which in reality was unusable for identification and left the binominal Sapium biglandulosum itself neither well defined nor clearly circumscribed.

Huber in 1906 attacked this untenable situation which he called "lutter avec le terrible bloc du Sapium biglandulosum" une agglomeration specific vaste "une especes collective sans delimitation exacte".

Adhering to a clear and simple binominal approach, and accompanied by a number of illustrations, he achieved a great deal of clarification. All authors after Huber: Hemsley (1908), Pax & Hoffm. (1912), Lanjouw (1931), Bro. Alain (1953) treating Sapium monographically followed Huber's ideas and have dropped the name Sapium biglandulosum (L.) Muller as a nomen confusum.

In 1893 Morong, disregarding Muller's action, revived the long dead Hippomane glandulosa L. (1753) and transferred it to Sapium, (see Britton and Morong in Ann. N.Y. Acad. Sci. 7: 227. 1893) putting Hippomane biglandulosa and Sapium biglandulosum into synonymy. Apparently he did not accept the correction made by Linnaeus in 1763 and considered biglandulosum illegitimate. At the same time he committed the error of applying this new name combination to a plant growing near Asuncion, Paraguay, which at that time was known as Sapium biglandulosum var. serratum f. longifolium Mull. Arg. and which we now call S. longifolium (Mull.) Huber.

When Linnaeus in the second edition of his Species Plantarum 1763 changed the epithet glandulosa to biglandulosa it was clearly a correction and not a creation of a new species. It is immaterial whether it was only a correction of a misprint, or if it also involved some correction of his previous judgment. H. biglandulosa was not intended to be a new species, otherwise he would not have dropped H. glandulosa at the same time.

As well known, the first edition of Species Plantarum abounds in errors and misprints and it was a frequent habit of Linnaeus to correct these in the second edition (see Stearn, Introduction to Sp. Plantarum 135. 1957).

It is hard to understand for what purpose Croizat (Jour. Arn. Arb. 24: 175. 1943) made two binominals, one based on the uncorrected and another based on the corrected version of the same Linnaean concept, and then use these to kill two perfectly clear and legitimate binominals: Sapium aucuparium Jacq. 1763 and Sapium hippomane G.F.W. Mey. 1818.

In view of the above discussion, the following binominals are rejected:

Sapium aucuparium Jacquin, Enum. Pl. Carib. 31. 1760 as not validly published.

Sapium biglandulosum (L.) Mull. Arg. in Linnaea 32: 116. 1863 as a nomen confusum in the sense of Art. 69.

Sapium biglandulosum Croizat in Jour. Arn. Arb. 24: 175 non Muller Arg. as a mis-application of an undefinable nomen confusum to a well defined and legitimate name Sapium aucuparium Jacq., Select. Amer. Hist. 249, pl. 158. 1763.

Sapium glandulosum (L.) Morong in Ann. N.Y. Acad. Sci. 7: 227. 1893 as a misapplication of a misprint. The plant to which this name is applied is now well covered by the new name S. longifolium (Mull.) Huber 1906.

Sapium glandulosum Croizat in Jour. Arn. Arb. 24: 176. 1943 non Morong 1893 by misapplication of a misprint to the legitimate name of S. hippomane G.F.W. Mey., Prin. Esseq. 275. 1818.

Sapium aucuparium Croizat in Jour. Arn. Arb. 24: 174. 1943 non Jacq. (1760) by misapplication of an invalid name to the valid and legitimate name of Sapium jamaicense Sw., Adnot. Bot. 62. 1829.

Sapium Cultivated in Caribbean and North America

Sapium jenmanii Hemsl.

Cultivated in Trinidad, and brought from Br. Guiana, Broadway s.n. (GH, GH, NY, US).

Sapium longifolium (Mull. Arg.) Huber

Florida: Pensacola, Curtiss 6859 (GH, NY). This collection was distributed as S. biglandulosum var. lanceolatum Mull. Arg. by Curtiss, who remarks that the seeds evidently came in ballast from South America.

Sapium obtusilobum Mull. Arg.

Cultivated at Hope Garden, Jamaica, from seeds brought from Cinchona by the late M. Patin, Harris s.n. (US).

Sapium sebiferum (L.) Roxb.

Cuba: Tropical Garden, Soledad, Cienfuegos, Jack 5303 (US, NY).

Martinique: Jardin Botanique, Duss s.n. (NY).

Porto Rico: Cultiv. Mayaque, Britton & Britton 8032 (NY).

Porto Rico: Bayamon, Stevenson 3677 (US).

Texas: Cameron Co., Brownsville, Lundell & Lundell 8710 (GH).

Texas: Harris Co., 5720 Palmatto St., Bellaire, backyard of Barker, Traverse 91 (GH).

Texas: Brownsville, Rose & Russell 24198 (A).

Texas: Galveston Co., 1/2 mile SE of Arcadia, Cory 51030 (GH).

Louisiana: Jefferson Davis parish, 3.2 miles east of Eltorr, Shiners 24202 (GH).

Louisiana: Calcasieu parish, 1 mile east of Lake Charles, Correll 9630 (GH).

Louisiana: Bayou Nezépique WG Basile, La., Nyland & Rogers 8727 (A).

Louisiana: Lake Charles, Calcasieu parish, Palmer 7643 (A), 8526 (A).

Louisiana: New Orleans, Dr. Torrey 1839 (GH).

Georgia: Chatam Co., Savannah National Wildlife Refuge, Mellinger s.n. (GH).

South Carolina: Savannah National Wildlife Refuge, Mellinger s.n. (GH).

South Carolina: Colleton Co., abund. natur. along causeway Combabee River, Godfrey 50936 (GH).

Sapium tolimense Jumelle

Cultivated at Cinchona, El. 4900 ft., Public Gardens, Jamaica, Harris s.n. (US, US, US). See Contrib. U.S. Nat. Herb. 18, 2: 72-73. 1914.

Sapium utile Preuss

Cultivated at Hope Gardens, Jamaica. Received from M. Chas. Patin, Medellin, Colombia, Harris s.n. (US).

Excludendae

Sapium appendiculatum (Mull. Arg.) Pax et K. Hoffm. - Mexico. Glandulae basi laminae = Sebastiania appendiculata.

Sapium biloculare (Wats) Pax - Northern Mexico, Arizona.

Folia linearia, ovarium biloculare = Sebastiania bilocularis.

Sapium biloculare var. amplum I.M. Johnston, Proc. Cal. Acad. Sci. ser. 4, 12: 1077. 1924. Lower California = Sebastiania ampla (I.M. Johnston) Jabl. comb. nov.

Sapium turckheimianum Pax et K. Hoffm., Pflanzr. 68, Addit: 61. 1919. Guatemala: Alta Vera Paz. Folia ima basi supra glandulis patellaribus obsita, apice plana = Sebastiania sp.

Sapium zelayense (HBK) Mull. Arg. - Guatemala, Panama, Mexico. = Stillingia zelayensis Rogers.

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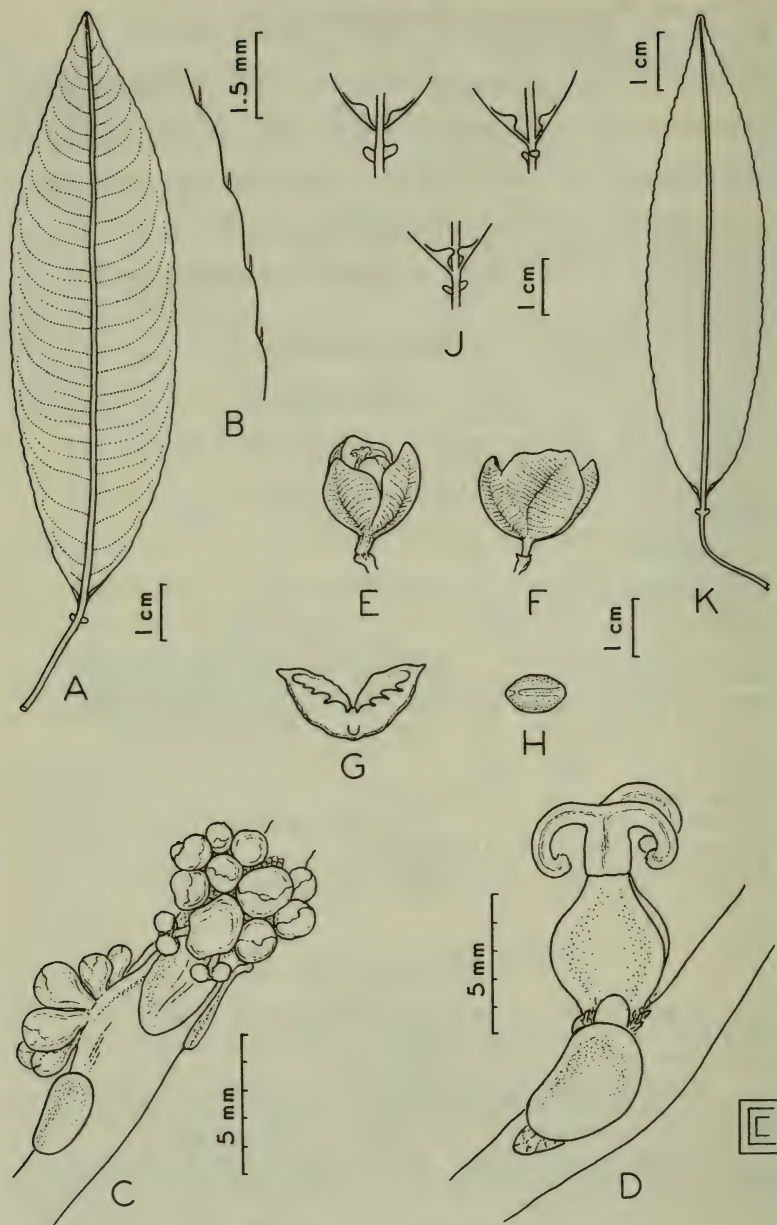
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Acknowledgments

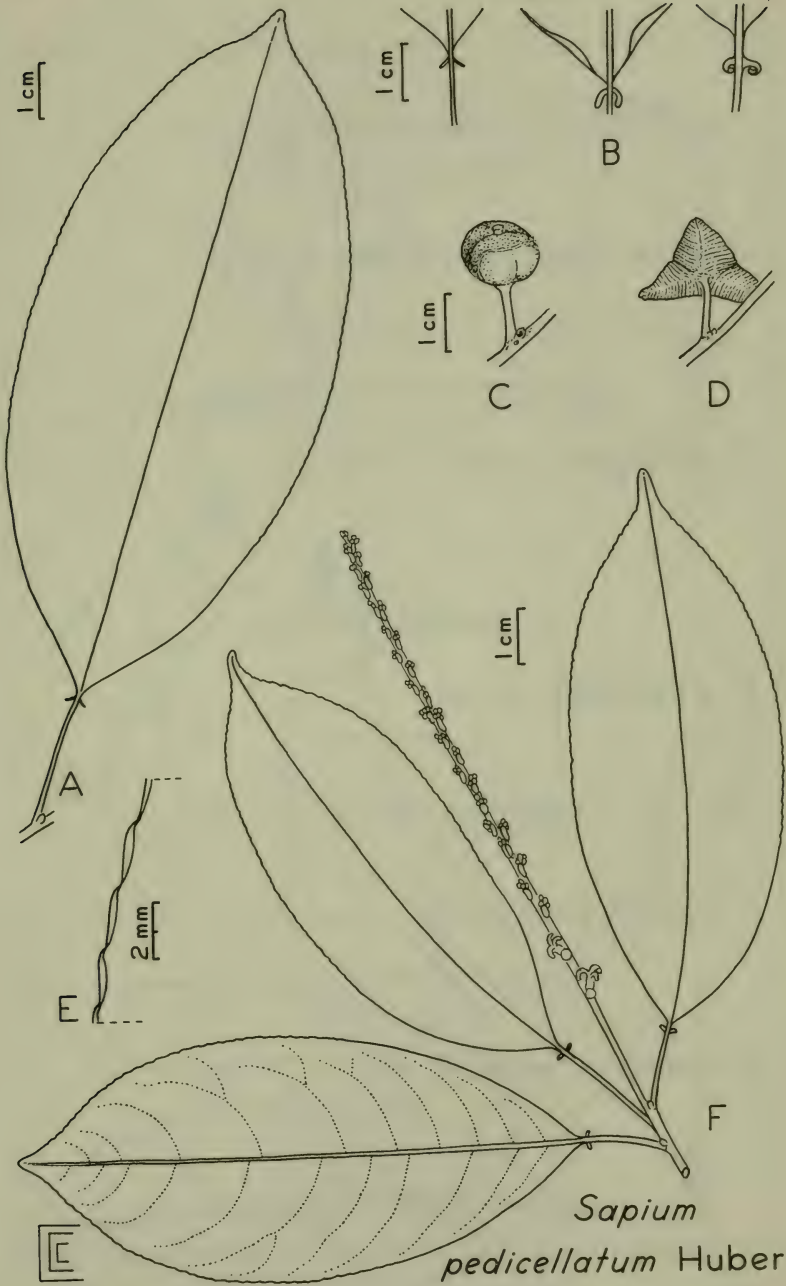
In conclusion, it is my pleasant duty to express my gratitude to the following people, without whom I would have never been able to finish this work:

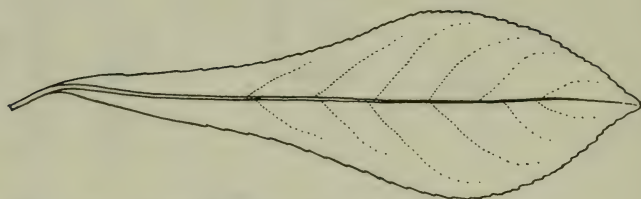
Rupert Barneby, who has helped, encouraged and supported my work and has unselfishly extended to me his storehouse of scientific knowledge and wide taxonomic experience.

Brother Alain Liogier, whose many years of field experience in the West Indies was an invaluable help to me in many geobotanical problems.

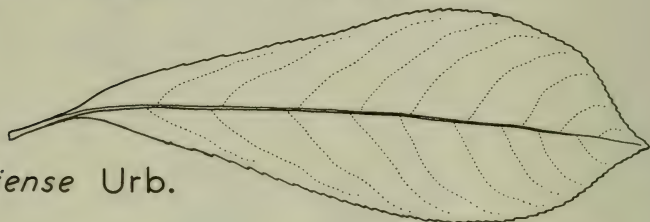


Sapium macrocarpum Müll. Arg.

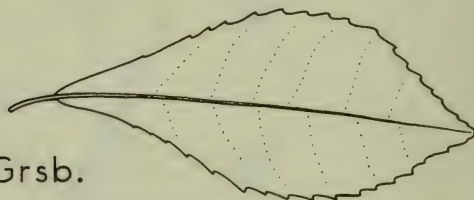




Sapium leucogynum Wr. & Grsb.



S. haitiense Urb.

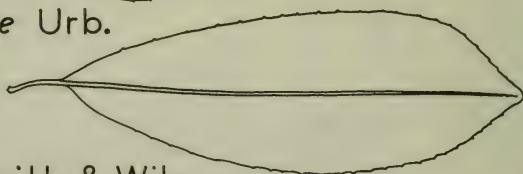


S. adenodon Grsb.

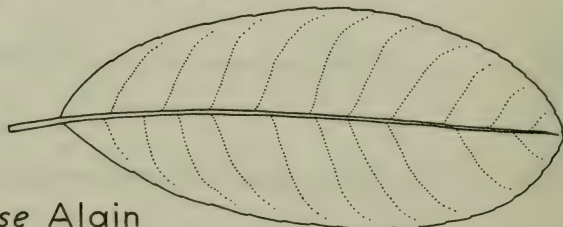


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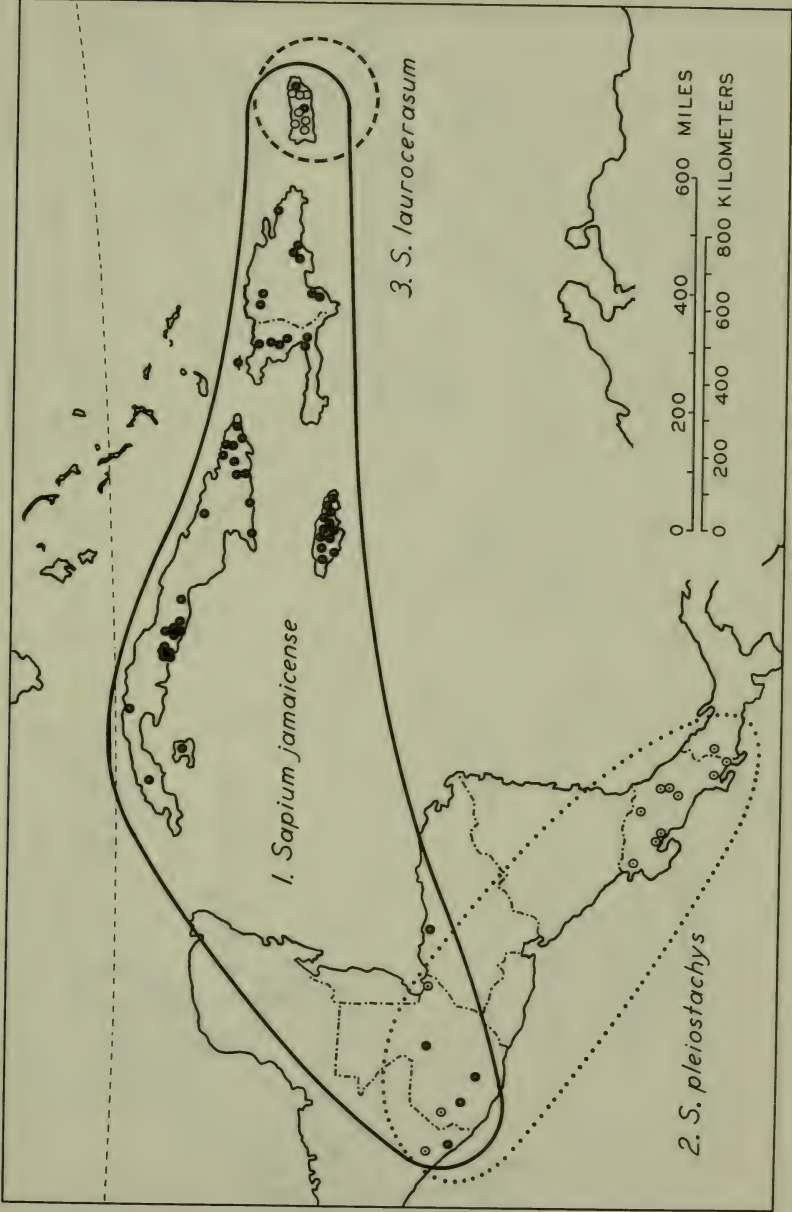
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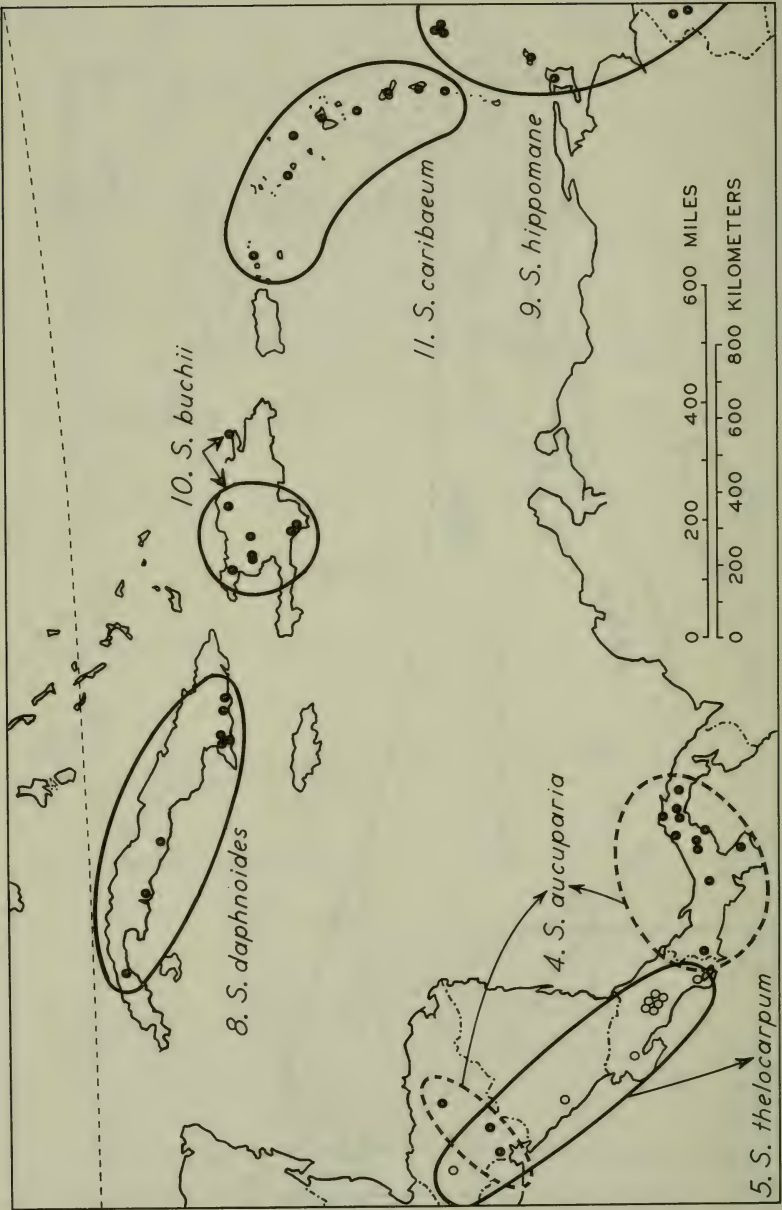


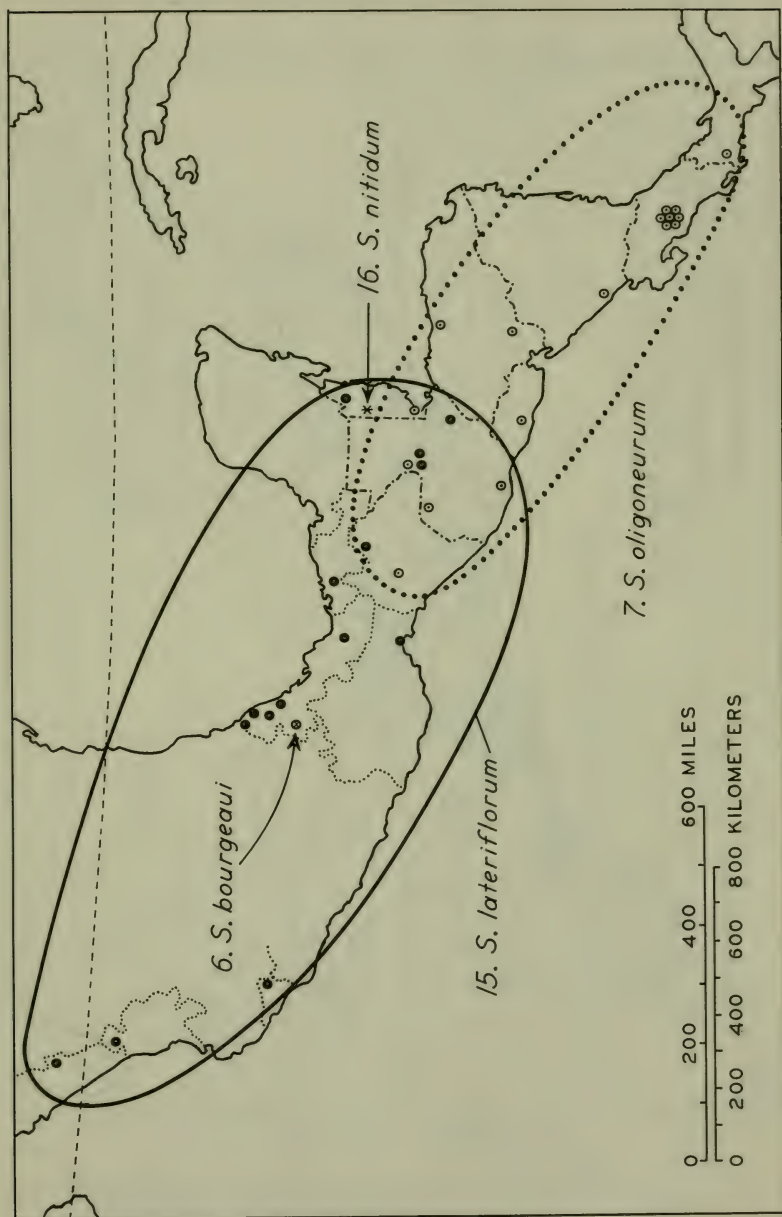
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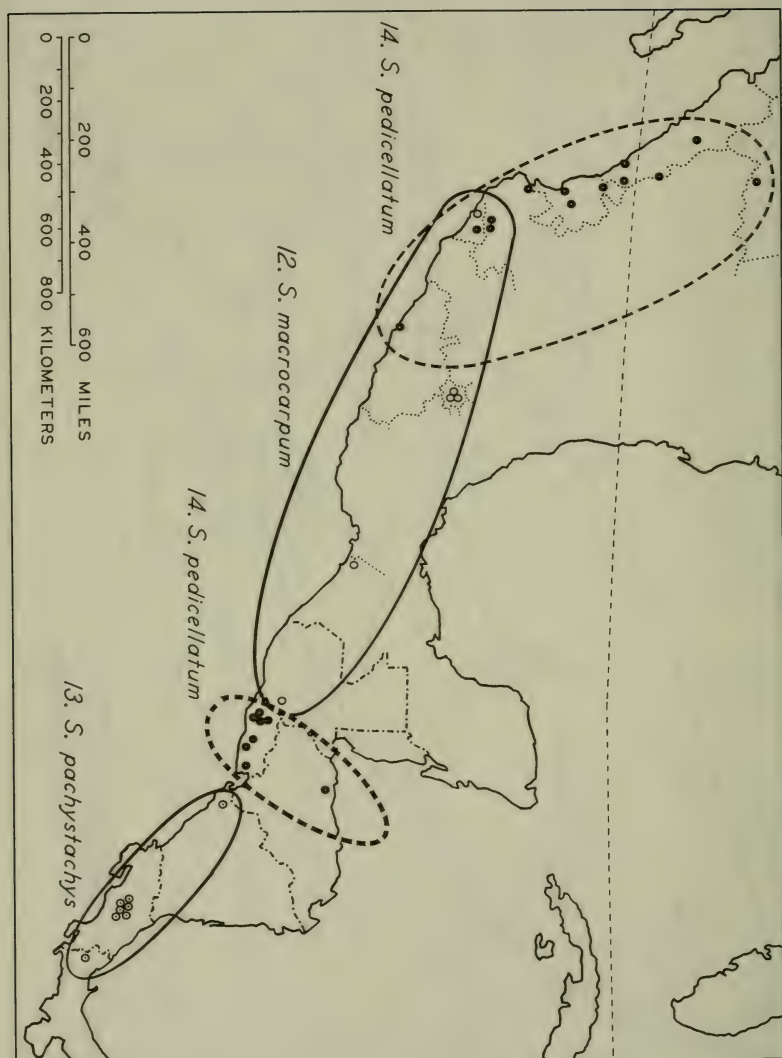


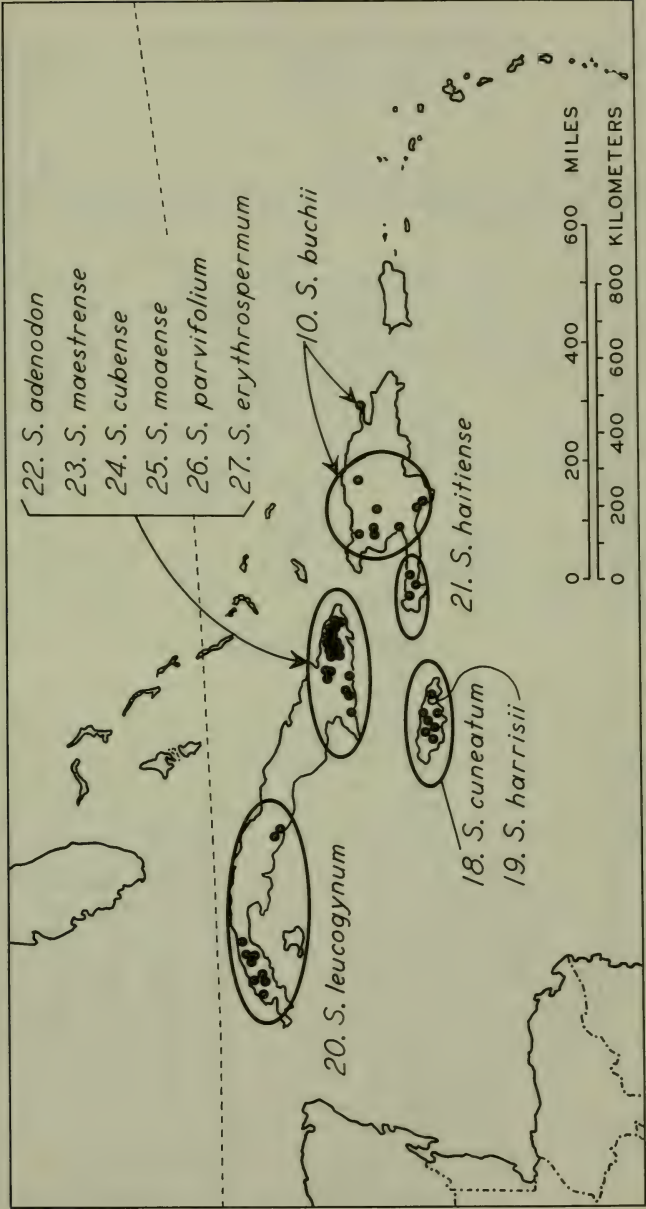
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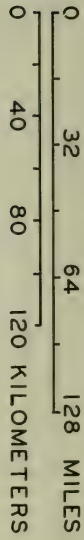




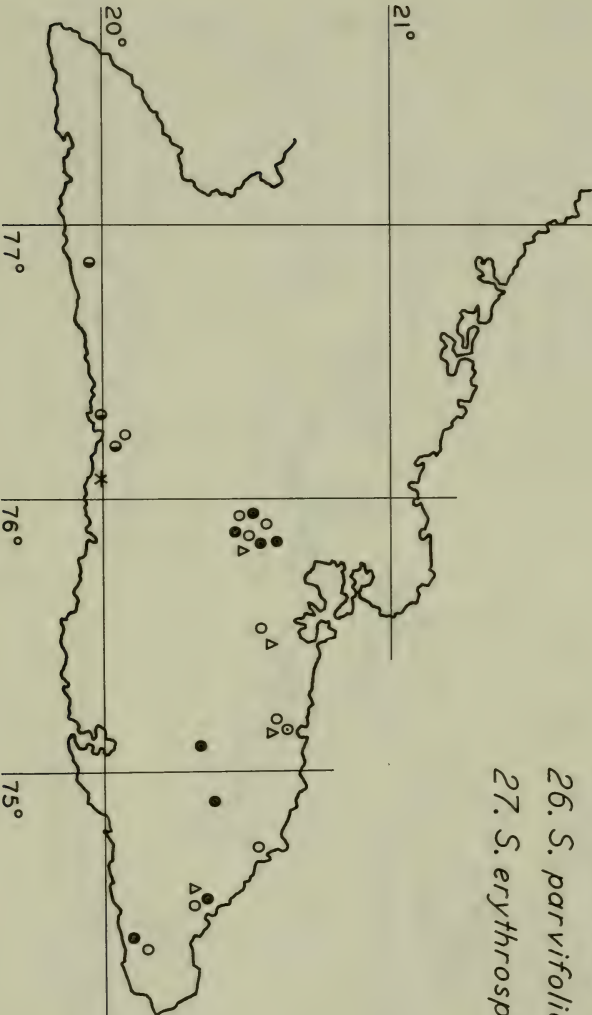








- 22. *S. adenodon* ●
- 23. *S. maestrense* ○
- 24. *S. cubense* ○
- 25. *S. moaense* ○
- 26. *S. parvifolium* △
- 27. *S. erythrospermum* *



MIMOSA ALBIDA AND ITS VARIETIES

Velva E. Rudd

About 600 species have been assigned to the genus Mimosa. Some are widespread and known to be variable; many are inadequately known.

In the course of identifying collections from the Galápagos Islands it was necessary to scrutinize specimens of M. albida, a notoriously polymorphic species. It was immediately evident that the group is "difficult" and that a thorough study of related species is needed to evaluate and align the taxa. Such a study I shall not attempt but because I need a name for use in the Flora of the Galápagos, I am proposing a new variety, and have prepared a brief résumé of Mimosa albida, sensu latior. This treatment is based almost exclusively on specimens in the U. S. National Herbarium.

Mimosa albida Humb. & Bonpl. ex Willd. ranges from Sinaloa, in western Mexico, southward through Central America to Brazil and Bolivia. It is a member of the complex series Sensitivae of Bentham (Trans. Linn. Soc. 30: 390-392. 1875), based on a subdivision of section Eumimosa DC. (Prodr. 2: 425. 1825).

The series Sensitivae is typified by M. sensitiva L. and now includes about 20-30 species occurring in Mexico, Central America, and South America. The group, including M. albida, is recognizable by its globose inflorescences and leaves with an eglandular petiole, 1 pair of pinnae, each bearing 1 or two pairs of relatively large leaflets. The stems may be pubescent or glabrous, armed or unarmed. The leaflets may be obliquely ovate, oblong or obovate; usually, one of the lower pairs of leaflets is much reduced in size, sometimes lacking. The leaflets may exhibit two sorts of pubescence, a puberulence of fine, more or less crispate hairs, and a sparse or dense indument of striga. The two sorts of hairs may occur together, separately, or be completely lacking, but the patterns appear to be specifically, or varietally, constant. The fruits offer the best characters for distinguishing or, at least, grouping species. Convenient and, apparently, natural divisions can be made between species with long, spreading setae on the fruit (M. sensitiva L., M. velloziana Mart., M. argentinensis Burk., M. panamensis Benth., etc.), with fruit glabrous or nearly so (M. nuda Benth., M. sensibilis Griseb., M. acapulcensis Robins.), and fruit with strigose or, rarely, hirsute pubescence (M. albida Humb. & Bonpl. ex Willd., M. manzanilloana Rose, M. standleyi Macbr.).

MIMOSA ALBIDA Humb. & Bonpl. ex Willd. Sp. Pl. 4: 1030. 1806;
Kunth. Mim. 2, pl. 1. 1819.

Shrubs, sometimes scandent or prostrate, to about 3 m. tall; young stems pubescent to subglabrous, armed with recurved thorns or unarmed; leaflets obliquely ovate to obovate, acute or obtuse, the surfaces glabrous or pubescent; flowers 4-merous, pink to purplish, borne in globose, pedunculate heads about 1.5-2 cm. in diameter at anthesis, the inflorescences axillary or terminal, usually racemose; fruit oblong, about 1-4 cm. long and 4-8 mm. wide, essentially sessile, notably strigose, rarely hirsute, dehiscent by breaking into 1-seeded articles and separating from the persistent margin.

For most practical purposes there is no need to determine collections beyond the species. There are times, however, when it is desirable to be more definite. Sometimes it is interesting to observe the geographic pattern, especially in relation to other species, and this can best be done if the variants are recognized.

Key to varieties of Mimosa albida

Leaflets puberulent or glabrous above, not strigose.

Fruit predominantly strigose.

Lower surface of leaflets uniformly strigose or puberulent, the upper surface puberulent to glabrous.

Fruit uniformly puberulent and strigose (Mexico to South America).....1. var. albida

Fruit essentially glabrous, with coarse strigae along the margin and a few on the surface of the valves.

Leaflets obliquely ovate, acute (Venezuela).....
2. var. willdenowii

Leaflets obliquely obovate, obtuse (Mexico).....
3. var. euryphylla

Lower surface of some leaflets glabrous, others sparsely strigose, the upper surface glabrous.

Young stems glabrous or nearly so, sometimes sparsely strigose or sparsely hirsute, often unarmed; fruit puberulent and sparsely strigose (Mexico).....

4. var. glabrior

Young stems puberulent, sometimes setose, armed or unarmed; fruit densely setose, sometimes glabrate (Ecuador; Peru).....5. var. erratica

Fruit densely hirsute (Ecuador).....6. var. aequatoriana

Leaflets strigose above and on the lower surface; fruit strigose. (Mexico to South America).....7. var. strigosa

1. MIMOSA ALBIDA Humb. & Bonpl. ex Willd. var. ALBIDA.
Mimosa adhaerans H.B.K. Nov. Gen. & Sp. 6: 249. 1824.
Mimosa racemosa Schlecht. Linnaea 12: 557. 1838.

Shrubs, sometimes scandent, to about 2 m. tall; young stems puberulent, usually armed; leaflets obliquely ovate, acute, puberulent to glabrous above, puberulent and usually also strigose below; fruit puberulent and strigose, 1.5-4 cm. long and 5-8 mm. wide.

Type: Moche, Peru, Humboldt & Bonpland 3756 (B; Field Mus. Neg. 1295 ex B).

Distribution: Known from Mexico, Guatemala, El Salvador, British Honduras, Honduras, Nicaragua, Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil.

As is to be expected, the differences between varieties are not clear cut. In cases of doubt, specimens are treated as of the typical variety. The collections from Brazil and some from Ecuador have fruits with the pubescence less tightly appressed than usual, suggesting a trend toward var. aequatoriana. Of the two synonyms cited above, M. racemosa, from Oaxaca, Mexico, is known to me only from the original description and M. adhaerans from the description and a photograph (Field Mus. Neg. 1294 ex B). the latter, presumably, is from Venezuela. It was cited as "Cresit cum praecedente", M. strigosa, which "Cresit ad Orinocum." I have seen no other collections from that area and, because many of the Humboldt and Bonpland localities have proved to be erroneous, there is some question as to the actual type locality.

2. MIMOSA ALBIDA var. WILLDENOWII (Poir.) Rudd, comb. nov.
Mimosa floribunda Willd. Sp. Pl. 4: 1031, non Vent. 1803.
Mimosa willdenowii Poir. in Lam. Encycl. Suppl. 1: 50. 1810,
nom. nov. based on M. floribunda Willd.
Mimosa floribunda /var./ willdenowii (Poir.) DC. Prodr. 2:
426. 1825.
Mimosa albida var. floribunda (Willd.) Robins. Proc. Amer.
Acad. 33: 311. 1898.

Shrubs, sometimes scandent, to about 2 m. tall; young stems puberulent, armed or unarmed; leaflets obliquely ovate, acute, puberulent or glabrous above, uniformly strigose below; fruit 1.5-4 cm. long, 5-7 mm. wide, strigose along the margin and with a few strigae on the surface of the valves, otherwise glabrous or nearly so.

Type: Caracas, Venezuela, Bredemeyer s.n. (B; Field Mus. Neg. 1323 ex B).

Distribution: Known only from northern Venezuela.

In fruit characters, var. willdenowii is similar to var. eurphylla, from Mexico; in other characters, it is essentially identical to the typical variety. The name M. floribunda has sometimes been incorrectly attributed to H.B.K. and a collection of Humboldt and Bonpland from Cumaná cited as the type.

3. MIMOSA ALBIDA var. EURYPHYLLA Robins. Proc. Amer. Acad. 33: 311. 1898.

Shrub, to about 2.5 m. tall; young stems puberulent and also hispid, glabrescent, sparsely armed; leaflets predominantly obliquely obovate to elliptic, obtuse, mucronulate, glabrous above, the lower surface moderately strigose; fruit 1-2.5 (-3) cm. long, 4-7 mm. wide, essentially glabrous but with coarse strigae along the margin and a few on the surface of the valves.

Type: Valley of Jiquipilas, Chiapas, Mexico, Nelson 2927 (US).

Distribution: Known from Sinaloa and Chiapas, Mexico.

Additional material: MEXICO: Sinaloa: La Nevería, rocky hill N. of Mazatlán, Mexia 1099 (US). Chiapas: Jalisco (= Arriaga), Doyle 49 (US). Arriaga, Mell 2194 (US).

The type of this variety is a flowering specimen and is characterized by its obovate leaflets and flowers with glabrous calyces. The other specimens cited above are in fruit but are similar in leaflet shape and pubescence; the few remaining calyces are glabrous or nearly so. It would be helpful, however, to see fruiting specimens from the type locality. Similar fruits occur on specimens of var. willdenowii, from Venezuela, but the shape of the leaflets is a little different, as indicated in the key. Another specimen with similar fruit, but leaflets like those of var. strigosa, has been collected in Costa Rica.

4. MIMOSA ALBIDA var. GLABRIOR Robins. Proc. Amer. Acad. 33: 311. 1898.

Mimosa sesquijugata Donn. Sm. Bot. Gaz. 13: 74. 1888.

Mimosa manzanilloana Rose, Contr. U. S. Nat. Herb. 1: 326. 1895.

Shrub, often scandent or procumbent, to about 3 m. tall; young stems commonly glabrous or nearly so, sometimes sparsely strigose or sparsely hirsute, often unarmed; leaflets obliquely ovate, subelliptic, or obovate, acute, glabrous above, the terminal leaflets usually glabrous below, the lower pair sparsely strigose to glabrous; fruit puberulent and sparsely strigose, glabrescent, 2-2.5 (-4) cm. long and 5-8 mm. wide.

Type: Malpais, Dept. Santa Rosa, Guatemala, Heyde & Lux (Donn. Sm.) 4133 (GH). Isotype at US.

Distribution: Sinaloa, Mexico to El Salvador and, possibly, in Nicaragua and Panama.

Additional Material: MEXICO: Sinaloa: Mazatlán, Rose, Standley & Russell 13819 (US). Nayarit: Acaponeta, Rose, Standley, & Russell 14452 (US). Colima: Manzanillo, Palmer 905 in 1890 (US type of M. manzanilloana); Ferris 6038 (US). Guerrero: Acapulco, Palmer 68 in 1895 (US). Atoyac, Galeana, Hinton 10904 (US). GUATEMALA: Baja Verapaz: Santa Rosa, von Tuerckheim (Donn. Sm.) 1327 (US type of M. sesquijugata), 3904 (US). EL SALVADOR: Ahuachapán: Ahuachapán, Standley 19850 (US). NICARAGUA: Masaya: Masaya, SW. slopes of Volcán Santiago, Maxon 7660 (US). PANAMA: Canal Zone: Corozal-Panama road, Killip 3146 (US).

The leaflet pubescence of var. glabrior and var. erratica is strikingly different from that of other varieties of M. albida. In fruit characters, var. glabrior is like typical M. albida except that the strigae are sparse and very short. The specimen from Nicaragua is sterile and that from Panama may be a hybrid, but to indicate possible occurrence that far south, they are tentatively referred to M. albida var. glabrior.

5. MIMOSA ALBIDA var. ERRATICA Macbr. Field. Mus. Pub. Bot. 8: 91. 1930.

Shrub, usually prostrate or scandent, to about 2 m. tall; young stems puberulent, sometimes setose, armed or unarmed; leaflets obliquely ovate, subelliptic, or subobovate, acute, glabrous above, the terminal leaflets usually glabrous below, the lower pair, sparsely strigose to glabrous; fruit puberulent and strigose, sometimes glabrescent, 2-2.5 cm. long, 5-7 mm. wide.

Type: Tambo de Pariocota, Ancash, Peru, Macbride & Featherstone 2552 (F). Isotype at US.

Distribution: Known from Ecuador and Peru.

Additional material: ECUADOR: Imbabura: Ibarra, vicinity of Lake Yaguarcocha, Penland & Summers 851 (US). Azuay: Tablón de Oña, Fosberg 23215 (US). Loja: Loja, Rose, Pachano, & Rose 23256 (US). PERU: Lambayeque: E. of Olmos, Hutchison & Wright 3402 (US). La Libertad: Cerro Cabezón, Trujillo, López 676 (US). Lima: S. of Santa Clara, Rose 18631 (US). Chosica, Soukoup 2057 (US). Arequipa: Lomas de Atiquipa, between Nozca and Chala, Ferreya 6465 (US).

This is very similar to var. glabrior in leaflet characters but its fruits and general appearance suggest var. albida.

6. *MIMOSA ALBIDA* var. *AEQUATORIANA* Rudd, var. nov.

A varietate typica fructibus hispidus differt.

Shrub, sometimes scandent, to about 2 m. tall; young stems puberulent, armed or unarmed; leaflets obliquely ovate to sub-elliptic, acute, puberulent above, usually glabrescent, puberulent and strigose or substrigose below; fruit 1.5-2.5 cm. long, 4-5 mm. wide, densely hirsute with setae 1-2 mm. long.

Type: In the U. S. National Herbarium, no. 1021791, collected in the vicinity of Guayaquil, Ecuador, August 11, 1918, by J. N. Rose and George Rose (no. 22111). Isotype at GH.

Distribution: Known from Ecuador, possibly from other areas.

Additional material: ECUADOR: Islas Galápagos: Isla San Cristóbal (Chatham), Schimpff 178 (CAS, NY). Guayas: Isla de Puná, Eggers 14750 (GH, US). Near Guayaquil, Jameson 582 (US); Mille s.n. (GH); Schimpff 411 (GH). Oil camp between Guayaquil and Salinas, Hitchcock 20041 (US), 20047 (GH, US). 4 km. E. of Chongón, Gilmartin 660 (US).

In spite of what would appear to be excessive taxonomic coverage of Mimosa albida, I believe that the specimens cited above are distinct enough to warrant recognition as a new variety. The fruits of var. aequatoriana, being uniformly hirsute rather than strigose, are unlike those of all other varieties of M. albida or, in fact, other species of the series Sensitivae. The vegetative parts and flowers, however, are indistinguishable from those of var. albida and, largely for that reason, I do not feel that specific rank is justified. Another reason for retaining this taxon within M. albida is the fact that some specimens of var. albida and var. strigosa show a tendency toward hirsute fruits, i.e., the strigae, instead of being tightly appressed, are somewhat raised. Very young fruits of those varieties often appear to be potentially hirsute because the strigae are relatively long, early reaching their full length. As the fruit enlarges, the strigae become less conspicuous. Two specimens, one from Mexico, the other from Colombia, bear immature fruits that, apparently, would retain the juvenile, hirsute character because of a galled condition due to insect activity. The specimens cited above as var. aequatoriana, although not fully mature, appear to be normal and uninfested.

7. MIMOSA ALBIDA var. STRIGOSA (Willd.) Robins. Proc. Amer. Acad. 33: 311. 1898.

Mimosa strigosa Willd. Sp. Pl. 4: 1030. 1806.

Mimosa williamsii Standley, Contr. U. S. Nat. Herb. 18: 105. 1916, non Rusby 1912.

Mimosa standleyi Macbr. Contr. Gray Herb. 59: 12. 1919, nom. nov. based on M. williamsii Standl.

Shrub, often scandent or prostrate, to about 3 m. tall; young stems puberulent or strigose, armed or unarmed; leaflets obliquely ovate, acute, densely and uniformly strigose on both surfaces; fruit strigose, 1-4 cm. long and 5-8 mm. wide.

Type: Probably collected by Humboldt. The original description cites no collector and the locality is given merely as "Habitat in America meridionali."

Distribution: Known from Mexico, Guatemala, British Honduras, Honduras, Costa Rica, Panama, Colombia, Venezuela, Ecuador, and Bolivia.

Like the typical variety, var. strigosa has a widespread geographic distribution. However, although the U. S. National Herbarium has a sizeable number of collections of Mimosa albida, there are none, of any variety, from the Orinoco region of Venezuela. It is possible that, again, there has been an error in citation of a Humboldt locality. A photograph of what might be the type of M. strigosa (Field Mus. Neg. 1377 ex B), indicates that the specimen was collected by Humboldt. The locality, not shown on the specimen, was given in a later publication (H.B.K., Nov. Gen. & Sp. 6: 248. 1824) as "ad Orinocum."

The var. strigosa differs from var. albida only in its leaflets, which are strigose above, as well as on the lower surface. Surprisingly, there seems to be little or no intergradation. All leaflets of a given plant are strigose above, or none are. The type of M. standleyi, from Panama (R. S. Williams 101), bears stipitate fruits, the apparent stipes due to abortion of the lowermost ovules, but in other characters it is indistinguishable from M. albida var. strigosa.

UNDESCRIBED SPECIES AND NOTES ON OTHER

PLANTS FROM MIDDLE AMERICA

Cyrus Longworth Lundell

PETENAEA CORDATA Lundell, Wrightia 3: 24. 1962.

GUATEMALA: Dept. Peten, Machaquila, km. 91 of road, in clearing, Oct. 20, 1966, Elias Contreras 6457 (LL), 6459 (LL), shrub, 15 ft. high, flowers red-carmine. BRITISH HONDURAS: El Cayo District, Fall del Carnero, Rio Mopan, Oct. 11, 1967, Contreras 7104 (LL), shrub, fruit red-purple; Benque Viejo, in low forest bordering Rio Mopan, Oct. 21, 1967, Contreras 7159 (LL), shrub, 20 ft., flowers red-carmine.

The species has been known only from the type locality along the north shore of Lake Peten Itza where it grows on the gypsum escarpment. These notable extensions of range further attest to the need for much more intensive collecting in the region.

XYLOSMA CHIAPENSE Lundell, sp. nov. — Arbor parva, armata; ramulis minute puberulis; folia petiolata, petiolo 3-4 mm. longo; lamina chartacea, lanceolata, 4-8 cm. longa, 1.5-3 cm. lata, basi obtusa vel rotundata, apice caudato-acuminata, minute serrulata, reticulata; flores dioeci, racemis dense puberulis, subsessilibus; pedicelli puberuli, 2.5-6 mm. longi; sepala lanceolato-oblonga, usque ad 3 mm. longa, glabra; ovarium glabrum; stylus 3-fidus.

MEXICO: Chiapas, Siltepec, Aug. 6, 1937, Eizi Matuda S-199 (LL, type), small tree.

The type is from a pistillate plant, and the raceme is abbreviated. The lanceolate, caudate-acuminate finely serrulate leaves puberulent above along the midrib are distinctive.

A staminate collection, D. E. Breedlove 15300 (LL) from Chiapas, appears to be referable here. The racemes of this staminate collection are up to 9 mm. long. The relationship of X. chiapense appears to be with X. quichense Donn. Sm. of Guatemala.

CALYPTRANTHES CONTRERASII Lundell, Wrightia 2: 205. 1961.

GUATEMALA: Dept. Peten, Seamay, in high forest on top of rocky hill, March 11, 1967, Elias Contreras 6716 (LL), small tree, 20 ft. high, 4 in. diam., fruits black-purple.

This is the second collection from Peten. The black-purple mature fruits are subglobose, up to 1 cm. in diameter when dry.

CALYPTRANTHES PETENENSIS Lundell, sp. nov. — Arbor parva, ramulis subteretibus, glabratis; folia petiolis 3.5–5 mm. longis stipitata; lamina oblongo-lanceolata vel oblanceolata, 5.5–7.5 cm. longa, 1.8–2.7 cm. lata, basi acuta, apice caudato-acuminata, chartacea, glabra, nervo medio supra versus basin canaliculato; inflorescentiae 1.3–3.5 cm. longae, 1–7-florae; pedunculi filiformes, ad 2 cm. longi; flores non vidi; fructus subglobosi.

GUATEMALA: Dept. Peten, La Esperanza, km. 140 of Cadenas Road, in low forest on top of rocky hill, east, Nov. 2, 1966, Elias Contreras 6499 (LL, type), small tree, 20 ft. high, 2 in. diam.

With affinity to *C. paxillata* McVaugh, the wing-angled branchlets and smaller flowers with calyptra about 2 mm. in diameter distinguish *C. petenensis*. A few appressed coppery hairs persist at tips of branchlets and on the inflorescences, but the plants are essentially glabrous in the fruiting stage.

EUGENIA AXILLARIS (Sw.) Willd. var. *COZUMELENSIS* (Lundell) Lundell, comb. nov. *Eugenia cozumelensis* Lundell, *Wrightia* 3: 13. 1961.

MEXICO: Quintana Roo, Cozumel Island, in forest, San Miguel, Aug. 6–8, 1932, W. C. Steere 2640 (LL, type). GUATEMALA: Dept. Peten, Macanche, between the lake and milpa, in low forest, May 20, 1966, Elias Contreras 5811 (LL), small tree, 35 ft. high, 4 in. diam., "guayabillo."

This pubescent form of *E. axillaris* is worthy of varietal status. In the Yucatan Peninsula, it has not been found before except on Cozumel Island.

EUGENIA ELIASII Lundell, sp. nov. — Arbor parva, 11-metralis, subglabra, ramulis crassis; folia glabra, petiolis usque ad 10 mm. longis stipitata; lamina elliptica vel obovato-elliptica, 6.5–11.5 cm. longa, 4–8 cm. lata, apice rotundata vel emarginata, basi subrotundata, coriacea; racemi abbreviati, usque ad 1 cm. longi; pedicelli fructiferi crassi, 1–1.5 cm. longi; calycis lobi rotundati, intus strigosi, majores 4 mm. longi; discus ca. 4 mm. latus; fructus subglobosi, diametro 1–1.5 cm.

GUATEMALA: Dept. Peten, Cadenas, on la Pedrera, on top of rocky hill, March 24, 1967, Elias Contreras 6838 (LL, type), small tree, 35 ft. high, 4 in. diameter, fruits dark red.

The thick leaves with inconspicuous venation are suggestive of those of several local species of *Clusia*. Although resembling a *Psidium*, the abbreviated racemes and unequal paired calyx lobes are characteristics of *Eugenia*.

EUGENIA LAUGHLINII Lundell, sp. nov. — Frutex, 3 m.; ramulis novellis minute peradpresse albo-pubescentibus; folia petiolata, petiolo 5–7 mm. longo; lamina subcoriacea, anguste oblanceolato-elliptica vel lanceolata, 4.5–7.5 cm. longa, 2–3 cm. lata, basi acuta, apice obtuse acuminata, subtus albido-cinerea, nervis lateralibus inconspicuis; racemi 3–15 mm. longi, albido-

canescenti, pauciflori; pedicelli 2-4 mm. longi; bracteolae distinctae, parvae, ovatae, 0.6-0.9 mm. longae; calycis lobi concavi, inaequales, majores 3 mm. longi rotundati; petala glabra, ciliata.

MEXICO: Chiapas, Municipio of Zinacantan, shrubby slope along Mexico 190 at Paraje Granadilla, elev. 4500 feet, June 15, 1966, Robert M. Laughlin 1070 (LL, type), shrub 10 feet tall.

Related to E. argyrea Lundell, the species may be recognized at once by its distinctive whitish indument consisting of minute closely appressed dibrachiate hairs. The indument of the under-surface of the leaves is persistent, the upper surface becomes yellow-green and glabrous with age. Only flower buds are available, and these, like all the inflorescences, are covered with the same minute indument of the leaves and twigs.

EUGENIA PERCIVALII Lundell, *Wrightia* 2: 124. 1961.

GUATEMALA: Dept. Peten, La Cumbre, in high forest on rocky hill, west of km. 140 of Cadenas Road, Sept. 21, 1966, Elias Contreras 6187 (LL), small tree about 30 ft. high, 4 in. diam., "guayabillo"; Seamay, bordering Santa Isabel River, in low forest, west, Mar. 8, 1967, Contreras 6684 (LL), shrub, 25 ft. high, 3 in. diam., fruits reddish-yellow.

The species has been known only from the type which was collected in the same forest on the British Honduras side of the border, Percy H. Gentle 7332 (LL). The Peten specimens are in fruit, and the large subglobose stipitate fruits measure up to 2.2 cm. in diameter. The leaves in the Contreras collections are thinner and mostly larger than in the type.

EUGENIA RUBELLA Lundell, *Wrightia* 3: 18. 1961.

GUATEMALA: Dept. Peten, Dolores, about 2 km. southeast of the village, on Rio Mopan trail, in high forest, June 29, 1961, Elias Contreras 2559 (LL, type), small tree, 2 in. diam., 10 ft. high; La Cumbre, on top of rocky hill, west of km. 139 of Cadenas Road, Sept. 23, 1966, Contreras 6200 (LL), shrub, 15 ft. high, fruits greenish, "guayabillo"; Seamay, on top of rocky hill, low forest, March 6, 1967, Contreras 6665 (LL), shrub, 25 ft. high, 3 in. diam., "guayabillo."

Known heretofore only from the type, two additional collections from the rain forest of southeastern Peten appear to be referable to the species. The specimens, in the early fruiting stage, have a distinctly racemose inflorescence with the raceme-axis up to 1 cm. long, and pedicels up to 5 mm. long.

Although appearing to be closely related to E. organoides Berg, the inflorescence is distinctive, and I doubt that the populations are of hybrid origin, as surmised by McVaugh (*Fieldiana: Bot.* 24: 357. 1963).

EUGENIA SHOOKII Lundell, Wrightia 2: 209. 1961.

GUATEMALA: Dept. Peten, La Cumbre, in high forest, west of km. 140 of the Cadenas Road, Sept. 21, 1966, Elias Contreras 6180 (LL), tree, 40 ft. high, 4 in. diam., fruits yellow-green; same locality, Sept. 28, 1966, Contreras 6267 (LL), tree, 35 ft. high, 5 in. diam., fruits yellow-green.

The species has been known heretofore only from the type locality near Dolores at km. 85 of the Flores-Poptun Road, where it is represented by 1961-1962 collections as follows: Contreras 2629 (LL, type), 2647 (LL), 2934A (LL), 2944 (LL); C. L. Lundell 17314 (LL).

In Contreras 6180 some of the oblong fruits exceed 2 cm. in length and have a curved sausage-like appearance.

HAUYA HEYDEANA Donn. Sm., Bot. Gaz. 18: 3. 1893.

GUATEMALA: Dept. Peten, bordering savanna in high forest, km. 65/66 of Poptun Road, Nov. 20, 1967, Elias Contreras 7232 (LL), 7234 (LL), shrub, 18 ft. high, 4 in. diam., flowers white.

MEXICO: Chiapas, in advanced forest on limestone, Trapichito, near Comitán, alt. 1350 m., June 2, 1945, Eizi Matuda 5754 (LL), tree, 4-5 m. high, flowers reddish-white.

The genus Hauya is new to Peten, and the species evidently has not been reported from Mexico.

HAUYA LUNDELLII Standl., Field Mus. Bot. 17: 204. 1937.

GUATEMALA: Dept. Peten, east of km. 158, Cadenas Road, in low forest on top of rocky hill, Nov. 10, 1966, Elias Contreras 6567 (LL), tree, 5 in. diam., 25 ft. high.

In fruit, the thick capsules are 4-5 cm. long. Known before only from the type collected nearby in British Honduras, this appears to be a rare species.

ACHRAS BREVILOBA (Gilly) Lundell, comb. nov. Manilkara breviloba Gilly, Tropical Woods 73: 19. 1943.

With clarification by William T. Stearn (Taxon 16: 382. 1967) of the status of the genus Achras, my transfer to this genus of the species in Middle America, described under Manilkara, reflects my conviction that Linneaus's genus should be retained for the sapodilla complex in the Americas.

ACHRAS CALDERONII (Gilly) Lundell, comb. nov. Manilkara Calderonii Gilly, Tropical Woods 73: 18. 1943.

ACHRAS CONZATTII (Gilly) Lundell, comb. nov. Manilkara Conzattii Gilly, Tropical Woods 73: 18. 1943.

ACHRAS GAUMERI (Gilly) Lundell, comb. nov. Manilkara Gaumeri Gilly, Tropical Woods 73: 19. 1943.

ACHRAS MERIDIONALIS (Gilly) Lundell, comb. nov. Manilkara meridionalis Gilly, Tropical Woods 73: 12. 1943.

ACHRAS ROJASII (Gilly) Lundell, comb. nov. Manilkara Rojasii Gilly, Tropical Woods 73: 11. 1943.

ACHRAS STAMINODELLA (Gilly) Lundell, comb. nov. Manilkara staminodella Gilly, Tropical Woods 73: 10. 1943.

ACHRAS STRIATA (Gilly) Lundell, comb. nov. Manilkara striata Gilly, Tropical Woods 73: 11. 1943.

ACHRAS TABOGAENSIS (Gilly) Lundell, comb. nov. Manilkara tabogaensis Gilly, Tropical Woods 73: 10. 1943.

MATELEA TIKALANA Lundell, sp. nov. — Suffrutex scandens, caulibus gracilibus teretibus parce puberulis; folia elliptica vel lanceolato-elliptica, 11–15 cm. longa, 5–8 cm. lata, apice acuta vel subacuminata, basi anguste subcordata et levissime auriculata, membranacea, supra glabra, basi parce puberula, petiolo 2–4.5 cm. longo, parce puberulo; inflorescentia axillaris pauciflora, pedunculo subnullo, pedicellis 4–11 mm. longis, minute puberulis; calyx ad basin partitus, lobis lanceolatis acuminatis 4 mm. longis, sparse puberulis; corolla alba ca. 1.7 cm. lata, glabra, lobis lanceolatis, ca. 8 mm. longis, 4 mm. latis, acuminatis.

GUATEMALA: Dept. Peten, Tikal National Park, Tikal, in ramonal bordering hotel, March 20, 1959, C. L. Lundell 15763 (LL, type), vine, flowers white; Tikal National Park, Remate Road, in second growth of roadside, Jan. 15, 1962, Lundell 17103 (LL), slender vine, flowers greenish.

The species is of unknown affinity and possibly referable to Marsdenia rather than Matelelea. It has been studied by Dr. Louis O. Williams, and publication at this time is desirable for inclusion in the Flora of Guatemala.

ADDITIONAL MATERIALS TOWARD A MONOGRAPH OF THE GENUS CALLICARPA.

X

Harold N. Moldenke

CALLICARPA KOCHIANA Mak.

Additional synonymy: Callicarpa roxburghii "Wall. ex Walp.", in herb.

Additional bibliography: Moldenke, Phytologia 16: 380--388. 1968.

The original description of C. lobo-apiculata Metc. includes the statement that the type specimen was originally determined as C. macrophylla Vahl "with a pencil note C. longiloba Merrill by P'ei... P'ei in Verb. China, 20 cited this number under C. Roxburghii Wallich. This species is characterized by the cup-shaped calyx, stellate-pubescent at base, with 4 apiculate teeth and is easily distinguished from C. macrophylla Vahl by this character alone. C. macrophylla has a glabrous calyx, truncate or with triangular lobes. It should not be confused with C. longiloba Merrill = Callicarpa roxburghii Wallich (C. tomentosa Willd; C. Loureirii Hooker and Arnott; C. americana Lour.), as the lobes are not subulate, inflorescence not congested and lobes not stellate-pubescent. C. Roxburghii Wallich (C. longiloba Merrill) has a villous calyx with 4 subulate lobes and the inflorescence is a trichotomous corymb."

P'ei (1932) cites the following additional specimens not seen as yet by me: CHINA: Chekiang: Keng 233. Fukien: H. H. Chung 3762; Hu 1334. Kwangtung: Chun 5120; E. D. Merrill E.C.1517 & s.n. [Canton and vicinity, Nov. 1917]. These are probably all deposited in the herbarium of Arnold Arboretum. Li (1963) cites: FORMOSA: Govern. Herb. 195 (A); Kato s.n. (Ca); Owatari s.n. (Tk); Simizu 2898 (Mo); E. H. Wilson 10114 (A, Bm, K), 10850 (A, Bm, K, W). Chung (1924) records the species from Kwangsi, but I have as yet seen no material to substantiate this record. It is possible that he is including C. lobo-apiculata in this taxon; it is known from that province.

Material of C. kochiana has been misidentified and distributed in herbaria as C. lobo-apiculata Metc. and as C. macrophylla Vahl. On the other hand, the E. H. Wilson 10850, cited by Li and distributed as C. kochiana, is actually C. formosana Rolfe; Ford s.n. [Hong Kong] is the type collection of C. lobo-apiculata Metc.; C. Wright s.n. [Bonin Islands] is C. nudiflora Hook. & Arn.; and R. C. Ching 2425 is C. tomentosa (L.) Murr.

In all, 101 herbarium specimens have been examined by me.

Additional citations: CHINA: Chekiang: R. C. Ching 2009 (Ca--281803, Ca--295648, W--1246868); Kan 1077 [Herb. Univ. Nanking 7314] (Ca--252265). Fukien: T. C. Chang 4344 (Du--250175), 4697 (Du--200032); Chang & Metcalf 146 (Ca--249223); Cheng 1899 (Bz--18066);

H. H. Chung 999 (Ca--224859), 2350 (Ca--233000), 2475 (Bz--18068), 2792 (Ca--243763), 2976 (Ca--243669); En 2302 (Bz--18067); Ging 5348 (Gg--151592), 5562 (Mi), 5651 (Gg--154157), 5966 (Um--83, Ws), 6674 (Mi), 6744 (Ws), 6948 (Gg--151591), 7001 (Mi), 7310 (Gg--151590); F. P. Metcalf 380 (Ca--252603, Vi). Kiangsi: S. K. Lau 4020 (S, W--1752761), 4456 (S, W--1753126); Tsiang 9999 (N). Kwangtung: N. K. Chun 40488 (Gg--237834); W. Y. Chun 3174 (N), 5870 (Du--250178); S. K. Lau 815 (N); C. O. Levine s.n. [Herb. Canton Chr. Coll. 1517] (Ka--63182, W--877419), s.n. [Herb. Canton Chr. Coll. 1819] (Ph, W--1428705); E. D. Merrill 10312 (Gg--31974), 10677 (Ca--992611, Gg--31975, N); Peng, Tak, & Kin 481 [Herb. Canton Chr. Coll. 12480] (Ca--274919, S, W--1247827); Shang 24 [Herb. Canton Chr. Coll. 14054] (Ca--318824); W. T. Tsang 21167 (Ca--11191, I, N, S), 21573 (Bz--18071, Ca--11136, I, N, N, S); Tsiang 1622 (Du--250176); Tsui 48 (N); Ying 609 (Bz--18599, N), 1622 (Bz--18598). Province undetermined: N. J. Andersson s.n. [China] (S, S). CHINESE COASTAL ISLANDS: Hainan: Fung 20404 (B, Bz--18072, Ca--11472, N, Ob--89224, W--1751181); How 73173 (Bz--17684); C. V. May 168 (Ca--373971). Lantau: W. T. Tsang 16581 (S). HONGKONG: W. Y. Chun 5121 (La); Didrichsen 3270 (Cp, Cp, Cp); Faber s.n. (N); Ford s.n. (N); Hance 337 (Bz--18600), s.n. (Os); A. Henry s.n. (N); Holman s.n. [July 1911] (Du--66762); Kuntze 3374 (N); Liou 757 (N); Taam 1507 (Ca--82694, W--2063796); Weiss 2588 (Bz--18597); C. Wright s.n. [Hong Kong] (T, W--9980); Ying 2987 (N). MACAO: Vachell 911 (T). WESTERN PACIFIC ISLANDS: JAPAN: Shikoku: Makino s.n. [Kochi, Prov. Tosa, Oct. 1902] (Bl--43757). FORMOSA: Kato 284 (Ca--345489); E. H. Wilson 10114 (W--1052935). CULTIVATED: Hongkong: Ford s.n. [Hongkong Bot. Gard.] (N). India: Herb. Hort. Bot. Calcutt. s.n. (Ed); Wallich 1833 (N). Russia: Herb. Hort. Pawl. s.n. (Us).

CALLICARPA KWANGTUNGENSIS Chun, Sunyat. 1: 302--303. 1934.

Bibliography: Chun, Sunyat. 1: 302--303. 1934; A. W. Hill, Ind. Kew. Suppl. 9: 45. 1938; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 56 & 87 (1942) and ed. 2, 130 & 177. 1949; Moldenke, Résumé 168 & 444. 1959.

Shrub, 1 m. tall, sparsely branched; branchlets terete, about 4 mm. in diameter, at first stellate-farinose, finally glabrescent, the older parts cinereous, the youngest parts dark vinous-purple; leaves deciduous; petioles stout, about 1 cm. long; leaf-blades membranous, narrowly elliptic-lanceolate, 16--18 cm. long, 3.5--4.5 cm. wide, rather long-acuminate at the apex, cuneate and decurrent into the petiole at the base, the upper 3/4 of the margins densely crenate-serrulate, glabrous or subglabrous on both surfaces, intensely green above, somewhat paler and rather densely golden-resinous-punctate beneath; secondaries 12--14 on each side, arcuate-ascending, flat above, elevated beneath, becoming purple

above like the midrib; cymes supra-axillary, about 3 cm. wide, dichotomous, about 25-flowered, stellate-pilose, short-pedunculate, the peduncles about 5 mm. long; pedicels 1 mm. long; bractlets and prophylla linear-lanceolate, stellate-pilose; calyx narrow-campanulate, 0.5 mm. long, attenuate at the base, sparsely resinous-punctate on the outside, the rim 4-dentate, the teeth triangular, subequal, scarcely more than 0.5 mm. long; corolla white, its tube 3.5 mm. long, the lobes short, oblong, spreading, 2 mm. long, rounded at the apex; stamens inserted near the base of the corolla, surpassing the corolla; anthers oblong, yellow, sparsely and minutely glandulose on the back, emarginate at the base, divaricate, about 2.5 mm. long, dehiscing by means of an apical pore; filaments glabrous, 4.5 mm. long; ovary globose, glabrous; style filiform, surpassing the stamens, 7 mm. long, glabrous, dilated at the apex; fruit not seen.

The type of this species was collected by Woon-Young Chun (no. 8671) from a cultivated plant growing in the Experimental Garden of the Botanical Institute, College of Agriculture, Sun Yatsen University, in Canton, China, in June, 1932, grown from seed collected by one of the Institute's collectors along the North River region in Kwangtung, China, without accompanying herbarium specimens. Chun notes (1934) that "The species is allied to Callicarpa japonica Thunb. var. angustata Rehder, differing from it in much large[r] elliptic-lanceolate leaves which are gradually acuminate at the apex, in many-flowered cymes, and the narrowly campanulate, distinctly dentate calyx. The young branches and inflorescence are dark vinous purple in color and are covered with a mealy stellate indumentum which readily disappears with age. The flowers are mildly fragrant with a delicate lilac-like odor. The leaves are wholly glabrous on both surfaces or, at most, with a very obscure sprinkling of stellate hairs on the upper surface when young."

The taxon is known to me only from the literature.

CALLICARPA LACINIATA H. J. Lam, Verbenac. Malay. Arch. 68. 1919.

Bibliography: H. J. Lam, Verbenac. Malay. Arch. 68 & 362. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 20. 1921; A. W. Hill, Ind. Kew. Suppl. 6: 34. 1926; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 66 & 87 (1942) and ed. 2, 147 & 177. 1949; Moldenke, Résumé 197 & 444. 1959.

Shrub; branchlets yellowish-gray-tomentose; leaves decussate-opposite; petioles 1.5--2 cm. long; leaf-blades membranous or subchartaceous, ovate or ovate-elliptic, 11--12 cm. long, 6--7 cm. wide, abruptly long-acuminate at the apex, coarsely and irregularly dentate-serrate along the margins except at the base, abruptly narrowed into the petiole at the base, stellate-puberulous above when young, glabrous above except for the venation when adult, gray-tomentellous beneath; cymes yellowish-gray-tomentose, equaling the petiole, hemispheric, 2 cm. in diameter, the peduncles 5 mm. long; calyx about 2 mm. long, densely white-tomentose, the rim distinctly 4-dentate, the teeth deltoid; corolla glabrous,

its tube short, 1 mm. long, the lobes spatulate, 3 mm. long, narrowed at the base; stamens and pistil exserted.

The type of this puzzling species was probably collected by Joseph Decaisne somewhere in Timor and is deposited in the herbarium of the Rijksherbarium at Leiden as sheet number 908.265—1435.

Lam (1919) says of this plant: "This curious Callicarpa has in its habit a close affinity with C. cana, especially with var. § latifolia of that species. Its is, however, characterized by the exceptionnally long corolla-lobes, which is a unicum in Callicarpa. Perhaps it is an aberrant form of C. cana. We separate it from this species, however, as long as there is no indication thas it is an abnormal form of it." Bakhuizen van den Brink (1921) reduces it doubtfully to synonymy under C. cana L. [= C. candicans (Burm. f.) Hochr.].

The taxon is known to me only from the literature.

CALLICARPA LAMMII Hosokawa, Journ. Soc. Trop. Agr. Taiwan 6: 206. 1934.

Synonymy: Callicarpa glabra H. J. Lam, Verbenac. Malay. Arch. 82—83. 1919 [not C. glabra Koidz., 1918]. Callicarpa lammii Hosokawa apud A. W. Hill, Ind. Kew. Suppl. 9: 45. 1938.

Bibliography: H. J. Lam, Verbenac. Malay. Arch. 74, 82—83, & 362. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 25 & 26. 1921; H. J. Lam in Engl., Bot. Jahrb. 59: 25. 1925; Kanehira, Bot. Mag. Tokyo 95: 346. 1931; Kanehira, Fl. Micrones. 457. 1933; Hosokawa, Journ. Soc. Trop. Agr. Taiwan 6: 206. 1934; A. W. Hill, Ind. Kew. Suppl. 9: 45. 1938; Moldenke, Alph. List Invalid Names 9. 1942; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 63 & 87. 1942; H. N. & A. L. Moldenke, Pl. Life 2: 68. 1948; Hara, Enum. Sperm. Jap. 1: 183. 1948; Moldenke, Alph. List Cit. 2: 602. 1948; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 142 & 177. 1949; F. R. Fosberg, Pacif. Sci. 12: 20. 1958; Moldenke, Résumé 185, 243, & 444. 1959; Moldenke, Résumé Suppl. 3: 22 & 30. 1962; Moldenke, Phytologia 14: 162 (1966) and 14: 235, 236, & 255. 1967.

Glabrous shrub, 2 m. tall; branchlets glabrous or glabriusculous; petioles 1.5 cm. long, glabrous or subglabrous; leaf-blades membranous, broadly lanceolate, 10.5—17 cm. long, 4.5—8 cm. wide, acuminate at the apex, crenulate along the margins except at the base, acute and entire at the base, glabrous on both surfaces, glandular-punctate beneath; secondaries 4 or 5 on each side, with a few stellate hairs beneath; cymes dichotomous, rather lax, few-flowered, 2—3.5 cm. long and wide, glabrous or subglabrous; peduncles 1.5—2 cm. long; calyx 1.5 mm. long, glandular-punctate, with a few stellate hairs, the rim 4-dentate; pedicels 1—2 mm. long; corolla blue, glabrous, 4-striped, glandular-punctate, the tube 3 mm. long, the lobes 1 mm. long; stamens 6 mm. long; anthers glandulose; style 8 mm. long; ovary glandular-punctate.

The type of this species was collected by Josef Hüfer (no. 4)

at Fanaganam, at an altitude of 30 to 100 meters, on Saipan, Mariana Islands, on November 2, 1912, where the plant is called "hamlag".

Lam (1919) says "Our species has some affinity with C. japonica from which it differs in its dichotomous, never trichotomous cymes, larger leaves, longer petioles, etc." In his 1925 work he cites Hüfer 30, also from Saipan. Fosberg (1958) cites it from Pagan Island. The Lam (1925) reference is sometimes cited in error as "1924", and the Hosokawa original publication is sometimes cited as "1936", also apparently in error. Hara (1948) reduced the species to synonymy under C. dichotoma (Lour.) K. Koch, and Bakhuizen van den Brink (1921) does the same, but with a question.

The species has been found growing in forests, blooming in July and November. In all, 9 herbarium specimens have been examined by me.

Citations: WESTERN PACIFIC ISLANDS: MARIANA ISLANDS: Agiguan: Kondo s.n. [May 29, 1952] (Bi), s.n. [June 3, 1952] (Bi). Rota: Hosokawa 7688 (Bi, W-2036412). Saipan: Hosokawa 8033 (Bi); Kanehira 929 (Bi, N). Tinian: Hosokawa 7699 (Bi), 7710 (Bi).

CALLICARPA LANCIFOLIA Millsp., Field Columb. Mus. Publ. Bot. 2: 181. 1906 [not C. lancifolia Merr., 1915, nor Pav., 1936, nor Sessé & Moc., 1940].

Synonymy: Callicarpa fulva f. foliis lanceolatis Griseb., Cat. Pl. Cub. 216. 1866. Callicarpa obtusa Wright ex Moldenke, Résumé 245, in syn. 1959.

Bibliography: Griseb., Cat. Pl. Cub. 216. 1866; Millsp., Field Columb. Mus. Publ. Bot. 2: 181. 1906; Millsp. in Fedde, Repert. Spec. Nov. 7: 285. 1909; Prain, Ind. Kew. Suppl. 4, pr. 1, 34. 1913; Fedde, Repert. Spec. Nov. Gesamtverz. 58. 1914; Urb. in Fedde, Repert. Spec. Nov. 20: 346. 1924; Moldenke, Bull. Torrey Club 60: 55. 1932; Moldenke in Fedde, Repert. Spec. Nov. 39: 301 (1936) and 40: 38, 57, 59, 61-63, 119, 123, 129, & 131. 1936; Moldenke, Geogr. Distrib. Avicenn. 5. 1939; Moldenke, Prelim. Alph. List Invalid Names 10. 1940; Moldenke, Carnegie Inst. Wash. Publ. 522: 199. 1940; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 24 & 87. 1942; Moldenke, Alph. List Invalid Names 9. 1942; Moldenke, Alph. List Cit. 1: 184-186, 188, 306, & 312 (1946), 2: 420, 649, 650, & 652 (1948), 3: 929 (1949), and 4: 1144 & 1198. 1949; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 42 & 177. 1949; Alain, Rev. Soc. Cub. Bot. 13: 38. 1956; Alain in León & Alain, Fl. Cuba 4: 305 & 308. 1957; Prain, Ind. Kew. Suppl. 4, pr. 2, 34. 1958; Moldenke, Phytologia 13: 431 & 433 (1966), 14: 232 & 233 (1967), and 16: 363. 1968.

Recent collectors describe this plant as a shrub, to 3 m. tall, growing on serpentine rock, in thickets, and on savannas, at altitudes of 600 to 800 meters, flowering in July, and fruiting in April and July. The corollas are described as "pale-lilac" on Ekman 9750.

The species was described as new both in 1906 and in 1909 [cfr.

references in the bibliography above]. Grisebach's C. fulva f. foliis lanceolatis is based on the same type collection as the accepted name for this taxon. The C. lancifolia of Merrill is a synonym of C. merrillii Moldenke, while that of Pavon and of Sesse & Mocillo is C. acuminata H.B.K. A vernacular name recorded for our plant is "filigrana", an epithet also applied to other species of this genus in Cuba.

Material has been misidentified and distributed in herbaria as C. crassinervis Urb.

In all, 46 herbarium specimens, including type material of all the names involved, and 11 mounted photographs have been examined by me.

Additional & emended citations: CUBA: Oriente: Carabia 3803 (Ha, N); Ekman 5938 (N), 9750 (Mi, N); León 19275 (Ha), 19312 (Ha, N), 19325 (Ha, Ha, N), 20374 (N); León & Alain 19271 (Ha, N), 19275 (N), 19312 (N), 19325 (N), 20374 (Ha, N); León, Victorin, & Alain 19870 (Ha, N, N); López Figueiras 1838 (Z); Shafer 3312 (F--286205); C. Wright 3173 [Herb. Sanvalle 1772/1] (E--119317--isotype, F--183675--isotype, Hv--isotype, Mi--photo of type).

CALLICARPA LEONIS Moldenke in Fedde, Repert. Spec. Nov. 33: 142. 1933.

Synonymy: Callicarpa leonii Moldenke, Prelim. Alph. List Invalid Names 11, in syn. 1940.

Bibliography: Moldenke in Fedde, Repert. Spec. Nov. 33: 142 (1933), 39: 299 (1936), and 40: 56, 73, 75, 78--80, 119, & 126. 1936; A. W. Hill, Ind. Kew. Suppl. 9: 45. 1938; Moldenke, Geogr. Distrib. Avicenn. 5. 1939; Moldenke, Prelim. Alph. List Invalid Names 11. 1940; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 24 & 87. 1942; Moldenke, Alph. List Invalid Names 9. 1942; H. N. & A. L. Moldenke, Pl. Life 2: 81. 1948; Moldenke, Alph. List Cit. 2: 647. 1948; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 42 & 177. 1949; Alain in León & Alain, El. Cuba 4: 305 & 307. 1957; Moldenke, Résumé 50, 244, & 444. 1959.

Recent collectors have found this plant in pine barrens and wet woods, at altitudes of 800 to 900 meters, blooming and fruiting in January. Material has been misidentified and distributed in herbaria under the name C. apiculata Urb.

In all, 5 herbarium specimens, including type material of all the names involved, and 2 mounted photographs have been examined by me.

Additional citations: CUBA: Oriente: Alain 3077 (Hk), 3377 (Z), 3743 (Z); León 11783 (Ha--isotype).

CALLICARPA LINGII Merr., Journ. Arnold Arb. 8: 16--17. 1927.

Bibliography: E. D. Merr., Journ. Arnold Arb. 8: 16--17. 1927; Rehd. & Wils., Journ. Arnold Arb. 8: 193--194 & 240. 1927; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 16 & 47--49, pl. 4. 1932; Worsdell, Ind. Lond. Suppl. 1: 160. 1941; Moldenke, Known

Geogr. Distrib. Verbenac., ed. 1, 56 & 87. 1942; H. N. & A. L. Moldenke, Pl. Life 2: 69. 1948; Moldenke, Phytologia 3: 139. 1949; Moldenke, Known Geogr. Distrib. Verbenac., ed. 2, 131 & 177. 1949; Moldenke, Résumé 168 & 444. 1959; Moldenke, Phytologia 14: 148. 1966.

Illustrations: P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] pl. 4. 1932.

Glabrous or subglabrous shrub; branches pale, terete, glabrous; branchlets terete, about 2 mm. in diameter, minutely stellate-puberulous; principal internodes to 9 cm. long; leaves decussate-opposite, subsessile or very short-petiolate; petioles scarcely 1 mm. long, sparsely stellate-puberulent; leaf-blades chartaceous or submembranous, oblong, 15--22 cm. long, 5--6.5 cm. wide, olive-green above, slightly paler beneath, distinctly acuminate at the apex, remotely and minutely callose-denticulate along the margins, narrowed toward the base, abruptly obtuse and about 7 mm. wide at the base; secondaries 10--12 on each side, distant, curved, distinct, loosely arcuate-anastomosing, the veinlet reticulation lax; flowers not known; infructescence solitary, supra-axillary, cymose, about 2.5 cm. long, minutely stellate-puberulent with deciduous hairs, subsessile, branched slightly above the base, the branchlets and pedicels short, glabrous or subglabrous; bractlets linear-lanceolate, 1--2 mm. long; fruiting-calyx about 3 mm. in diameter, glabrous, the rim lightly undulate-crenate; fruit broadly ovoid or subobovoid, about 3 mm. long, glabrous.

The type of this species was collected by Kan Ling (no. 1313; Herb. Univ. Nanking 7851) -- in whose honor it was named -- in a forest at Wu Yuen, Anhwei, China, on August 23, 1924, and is deposited in the herbarium of the University of California at Berkeley, California. The type as originally given in the first description of this species (on page 17) is "Ling 7851"; however, the more correct citation is given in the second description of the species (on page 193) as "Ling 1313, Herb. Univ. Nanking 7851". The Rehder & Wilson reference (1927) is sometimes erroneously cited as volume 7 and dated "1926".

Merrill (1927) comments that "The alliance of this species is manifestly with Callicarpa brevipes (Benth.) Hance from which it is at once distinguished by being nearly glabrous except for the branchlets and the inflorescences, as well as by its much longer glabrous leaves." P'ei adds (1932): "I have seen only the type which has good leaves and fruit. It is related to Callicarpa collina Diels from which it differs by its sessile and cordate leaves which are nearly glabrous; while the leaves of C. collina Diels are pubescent beneath at least along the nerves, cuneate at base and narrow lanceolate."

Only a single herbarium specimen of this species has been seen by me.

Citations: CHINA: Kiangsi: Tsiang 10441 (N).

CALLICARPA LOBO-APICULATA Metc., Lingnan Sci. Journ. 11: 406, fig. 1. 1932.

Bibliography: Metc., Lingnan Sci. Journ. 11: 406, fig. 1. 1932; A. W. Hill, Ind. Kew. Suppl. 9: 45. 1938; Merr. & Chun, Sunyat. 5: 178. 1940; Worsdell, Ind. Lond. Suppl. 1: 160. 1941; Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 56, 58, & 87 (1942) and ed. 2, 131, 134, & 177. 1949; Moldenke, Alph. List Cit. 4: 1011. 1949; Moldenke, Résumé 168, 183, & 444. 1959; Hanelt, Kulturpfl. 11: 224. 1963; Moldenke, Phytologia 16: 388 & 447. 1968.

Illustrations: Metc., Lingnan Sci. Journ. 11: 406, fig. 1. 1932.

Woody shrub, about 1.1 m. tall; branches densely stellate-tomentose; leaves decussate-opposite; petioles densely stellate-tomentose; leaf-blades lanceolate to elliptic, 16--23 cm. long, 5.5--8 cm. wide, acuminate at the apex, shallowly glandular-dentate along the margins above the middle, broadly cuneate to obtuse at the base, glabrous above, densely stellate-tomentose beneath; inflorescence densely stellate-tomentose; cymes 6 times dichotomous, loosely flowered; calyx cupuliform, glabrous except for the stellate-pubescent base, its rim 4-apiculate; fruit subglobose, yellowish, about 2 mm. in diameter, glandulose, with 4 obscure ridges.

The original description of this taxon includes the statement that the type specimen was originally determined as C. macrophylla Vahl "with a pencil note C. longiloba Merrill by P'ei...P'ei in Verb. China, 20 cited this number under C. Roxburghii Wallich. This species is characterized by the cup-shaped calyx, stellate-pubescent at base, with 4 apiculate teeth and is easily distinguished from C. macrophylla Vahl by this character alone. C. macrophylla Vahl has a glabrous calyx, truncate or with triangular lobes. It should not be confused with C. longiloba Merrill = Callicarpa Roxburghii Wallich (C. tomentosa Willd; C. Loureiri Hooker and Arnott; C. americana Lour.), as the lobes are not subulate, inflorescence not congested and lobes not stellate-pubescent. C. Roxburghii Wallich (C. longiloba Merrill) has a villous calyx with 4 subulate lobes and the inflorescence is a trichotomous corymb."

The type of C. lobo-apiculata was collected by Charles Ford in Hongkong and is deposited in the herbarium of the Arnold Arboretum at Cambridge, Massachusetts. Tsang refers to the plant as "fairly common" as scattered shrubs in silt and muddy soil of swamps, flowering in July, in Kwangsi. The corolla is described as "red" on W. T. Tsang 22610. Merrill & Chun (1940) cite How 73173 from Hainan Island, taken from a plant which was a shrub, growing in thickets at 180 m. altitude, flowering in July. They note that "Metcalf's type was a Hongkong specimen, in fruit. This Hainan collection is not directly comparable with it because it is in bud and flower. The inflorescences are much shorter, possibly due to stage of development, while the leaves are somewhat smaller. We believe that Tsang 23119, 22779 from Kwangsi represent the same species, both having shorter inflorescences than the type."

BOOK REVIEWS

Alma L. Moldenke

"ENVIRONMENTAL BIOLOGY" edited by Philip L. Altman & Dorothy S. Dittmer, xxi & 694 pp., illus. Federation of American Societies for Experimental Biology, Bethesda, Maryland 20014. 1966. \$15.00.

The Committee on Biological Handbooks of the above mentioned organization and its expert advisory committee planned this book for the use of specialists whose work will be greatly facilitated by its accessible organization. It should also prove a valuable aid to instructors of biology in many of its phases on the university and even on the high school level for the guidance of some brighter students' projects. The use of NIH and NASA funds made this volume possible and certainly proved to be a worthwhile use of the taxpayers' funds.

Environmental biology is interpreted as covering the following wide variety of external factors effecting the normal biological experience of organisms from virus to man -- temperature, radiant energy, sound and vibration, acceleration and gravity, atmosphere and pollutants, gases, water, solutes, and biological rhythms. It is expressed quantitatively and qualitatively in tables, graphs and diagrams. Bibliographic references are given for all items. Not only is all the content well indexed, but there are scientific and equivalent common name tables.

A feeble effort is made to include the most commonly appearing names in synonymy, but the synonym Verbena hortensis is used instead of V. hybrida Voss and the synonym Lens culinaris is used instead of L. esculenta Moench.

"ORCHID FLOWERS - THEIR POLLINATION AND EVOLUTION" by L. van der Pijl & Calaway H. Dodson, x & 214 pp., illus. University of Miami Press, Coral Gables, Florida 33124. 1967. \$12.50.

The authors, the above mentioned university press and the Fairchild Tropical Garden offer this well written and beautifully illustrated book in honor of the centenary of the publication of Charles Darwin's famous "Fertilization of Orchids by Insects". It has 48 full-color and 89 black-and-white photographs, often showing a typical insect visitor or pollinator on the orchid blossoms. In addition there are helpful line drawings and diagrams. The text is composed by well qualified botanists; the entomological work is checked by none other than C. Michener. There are excellent listings of general syndrome characteristics of orchids and their various pollinators -- bees, lepidopterans, birds, flies, especially --, a synopsis of taxonomic relations in the orchids, a list of orchids and their own pollinators, a glossary,

a vocabulary, and a bibliography. The printing and paper are well chosen. On page 145 "influence" is misspelled.

"THE KOMAROV BOTANICAL INSTITUTE - 250 YEARS OF RUSSIAN RESEARCH" by Stanwyn G. Shetler, xiv & 240 pp., illus. Smithsonian Institution Press, Washington, D. C. 20560. 1968. \$5.95.

Starting in 1703 and 7° south of the Arctic Circle, the far-seeing Tsar founded Russia's "window to the west" on the Baltic Neva Delta called first for him St. Petersburg or Petrograd and later Leningrad. Here he actually founded two scientific institutions that with other descendants culminated in the Komarov in 1931.

Because the author had the privilege of visiting here in 1964, the year of the 250th anniversary, and because he has specialized in arctic botany, his book has been able to bridge the language/culture/political gap and to share his enthusiasm for the great work done here for so many years. It is actually a history of Russian botany.

Today this institution has a huge herbarium and library, many major laboratories, large greenhouse and outdoor garden setups, complexes of experimental farms, an arboretum, a 30-volume "Flora of the USSR", and a staff of 700 for all these efforts. This interesting and useful book is a "window from the west".

"SOUTHWESTERN LOUISIANA JOURNAL" edited by K. E. Toombs, vii & 83 pp. University of Southwestern Louisiana, Lafayette, Louisiana. 1967,

After a publication gap since 1962 Volume 7 of this journal has appeared, containing a useful annotated "Bibliography of Louisiana Botany" by the very capable Joseph Ewan. This is the first part of an N. S. F. sponsored and much needed "Flora of Louisiana" which will be published herein subsequently in serial form and later in book form.

"WILD FLOWERS OF NORTH CAROLINA AND SURROUNDING AREAS" by William S. Justice & C. Ritchie Bell, xxvii & 217 pp., illus. University of North Carolina Press, Chapel Hill, North Carolina. 1968. \$7.75.

Welcome to this delightful and valuable book which is published under the sponsorship of the Garden Club of North Carolina and the North Carolina Botanical Club!

Four hundred fullcolor flowering or fruiting photographs of some of the 2945 species of this state are the exquisite contribution of Dr. Justice. Matching short texts -- giving common and scientific names, origin, size, special items of botanical interest, frequency, range, habitat, blooming time and index numbers referring to the more detailed scientific data in the "Manual of the Vascular Flora of the Carolinas" by Radford, Ahles, & Bell -- are the fine contribution of the highly qualified Dr. Bell.

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A NEW COMBINATION IN VRIESEA

(BROMELIACEAE)

Robert W. Read
Postdoctoral Research Associate
Smithsonian Institution
Washington, D.C.

In recent years a number of bromeliad species have been transferred from the genus Tillandsia into the genus Vriesea based upon the presence of scales on the inside near the base of the petals. Although various combinations of vegetative characters along with inflorescence characters generally serve for distinguishing between the two genera, it is frequently necessary to have flowers in order to make a positive determination. The examination of flowers is of particular importance with species having narrowly triangular gray-lepidote leaves. Many poorly known species have remained in the genus Tillandsia simply because the flowers have not yet been collected.

During recent field studies in Jamaica it was possible to collect and examine carefully, many plants of "Tillandsia" incurva, a species with narrowly triangular gray-lepidote leaves. The petals were found to possess large flap-like scales adnate to the base, such as are characteristic of the genus Vriesea. In addition the somewhat inflated leaf bases which are dark-castaneous and brown-lepidote, the leaf blades which are strongly appressed-lepidote, but green adaxially and gray-lepidote abaxially, gray-lepidote over pink or purple floral bracts and the strongly angled and winged rachis, all suggest a close affinity with species which are already placed in the genus Vriesea; i.e. Vr. cereicola (Mez) L.B. Smith, Vr. hitchcockiana (L.B. Smith) L.B. Smith, Vr. patula (Mez) L.B. Smith, Vr. pereziana André, and Vr. robusta (Griseb.) L.B. Smith. It is therefore necessary to make a new combination, Vriesea incurva (Griseb.) R.W.Read, in order to place this species in proper perspective with its nearest allies.

Examination of specimens of Vriesea incurva in the herbarium of the Smithsonian Institution has disclosed that plants of the Costa Rican population differ from those in Jamaica in that the petal scales are rarely produced. Evidence of their occasional appearance was found in a specimen collected by Paul Standley at Puntarenas (No. 39533). One of the flowers examined on this specimen exhibited a single scale on only one of the petals, although there are normally two scales on each of the three petals in Jamaican plants. It appears that at least in Costa Rica the possession of petal scales is a variable character. A greater number of flowers would be necessary in order to determine the ratio of petals with scales to those without. In all other respects the Costa Rican plants are essentially indistinguishable

from the Jamaican plants. Specimens from South America and elsewhere lacked flowers so it is not possible to determine the extent of variability of this character at the present time.

VRIESEA INCURVA (Griseb.) R.W. Read, comb. nov.

Tillandsia incurva Griseb. Nachr. Ges. Wiss. Goett. for 1864:15. 1865. TYPE: Fendler 1524, Colonia Tovar, Venezuela.

T. dactylifera E. Morr. ex Baker, Handb. Bromel. 181. 1889.

TYPE: Ernst s.n. Caracas, near San Chorquiz, Venezuela.

T. digitata Mez in DC. Monogr. Phan. 9:715. 1896.

TYPE: Van Houtee No. 6. Costa Rica.

T. castaneo-bulbosa Mez & Wercklé, Bull. Herb. Boiss. II. 3:140. 1903. TYPE: Wercklé 16189, Environs de Cartago, Costa Rica.

Distribution: Greater Antilles, Costa Rica to Venezuela and Bolivia.

Vriesea incurva has been seen only in the cooler habitats in Jamaica and appears to be a strict epiphyte in regions frequently bathed in fogs or clouds on mountain ridges from 2500 feet elevation on Mount Diablo to over 7000 feet elevation in the Blue Mountains.

A complete description, an illustration and specimen citations appear in Smith, L.B., Contributions to the United States National Herbarium vol. 29, page 499. 1951. The report of this species in Florida is based on a collection by Blodgett, in Key West, and is not Vr. incurva but is more likely a form of Tillandsia valenzuelana.

Specimens examined from Jamaica are; Blue Mountains; J.A. Harris & J.V. Lawrence C 15211 (US); Harris 5131 (as "Tillandsia harrisii Mez n. sp.", UCWI); C.D. Adams 10660 (UCWI); R.W. Read 1723 (US); Mount Diablo; R.W. Read 1762 (US).

NOTES ON BROMELIACEAE, XXVIII

Lyman B. Smith

NAVIA

(Supplement to revision in Bromeliaceae of the Guayana Highland, Mem. New York Bot. Gard. 14, pt. 3: 15. 1967)

37b. *N. ROBINSONII* L. B. Smith, sp. nov. A *N. naviculare* Smith & Steyermark sepalis subduplo majoribus et foliis subtriplo minoribus differt.

PLANT short-caulescent but branching. LEAVES numerous, rosulate at the stem ends, 10 cm long; blades spreading, narrowly triangular, 9 mm wide but mostly involute and appearing narrower, covered beneath with fine irregularly stellate scales but becoming wholly glabrous, densely serrulate with fine antrorse teeth. INFLORESCENCE subsessile, digitate from 5-7 spikes, glabrous; primary bracts broadly ovate, acuminate, pungent, much shorter than the spikes, entire, strongly nerved, red-brown; spikes ellipsoid, many-flowered, 2 cm long. FLORAL BRACTS ovate, acuminate, much shorter than the sepals, white. SEPALS free, narrowly subtriangular with a narrowly cucullate apex, apiculate, 13 mm long, white, the posterior ones narrowly alate-carinate. PETALS unknown. CAPSULE ovoid, beaked, 5 mm long; seeds naked, 0.8 mm long, reticulate, yellow-brown. Pl. I, fig. 1: Leaf-margin x 1; fig. 2: Inflorescence x 1; fig. 3: Posterior sepal x 5.

VENEZUELA: BOLIVAR: On rocks in sun, Cerro Jaua, near summit, alt. 2000 m, 4 January 1965, Brewer 250 (US, type; VEN).

This species is gratefully dedicated to Harold E. Robinson whose research in bromeliad anatomy has proved both inspiring and frustrating but never uninteresting.

68a. *N. LEPIDOTA* L. B. Smith, sp. nov. A *N. parvula* L. B. Smith, cui affinis, foliorum laminis subtus lepidibus latis adpressis dense vestitis, sepalis anterioribus auctis differt.

PLANT caulescent, forming cushions (! Maguire); stem erect, over 7 cm long, 6 mm in diameter. LEAVES (living) rosulate at the apices of the stems, 55 mm long; blades spreading or recurving, narrowly triangular, pungent, 6 mm wide, covered beneath with broad appressed cinereous scales, densely and finely serrulate. INFLORESCENCE nidular in the center of the leaf-rosette, few-flowered and apparently simple, 1 cm in diameter. FLORAL BRACTS ovate, attenuate or cuspidate, exceeding the sepals, thin, white, serrulate, nerved; flowers subsessile. SEPALS free, thin, serrulate, the anterior flat, much reduced, the posterior conduplicate, oblong, acute, to 8 mm long. OVARY slightly more than half inferior. Pl. I, fig. 4: Posterior sepal x 5.

VENEZUELA: AMAZONAS: West escarpment edge, northwest of Cumbre Camp, summit of Cerro de la Neblina, Río Yatua, alt. 1700-2000 m, 13 January 1954, Maguire, Wurdack & Bunting 37288 (US, type; NY).

NEOREGELIA

N. LEVIANA L. B. Smith, sp. nov. A N. margaretae L. B. Smith, cui affinis, foliorum vaginis maximis, valde inflatis et rosulam subglobosam efformantibus differt.

PLANT stemless, propagating vegetatively by short stout stolons. LEAVES 6-10; sheaths 9 cm long, about equaling the blades, ample, strongly inflated and forming a subglobose narrow-mouthed rosette, dark red-purple, densely appressed-lepidote on both sides; blades abruptly spreading, ligulate, acute, 25-30 mm wide, thick-coriaceous but pliable, subdensely punctulate on both sides, laxly serrate with antrorse to retrorse spines 1 mm long. INFLORESCENCE simple, few-flowered, 1 cm in diameter. FLOWERS obscurely pedicellate. SEPALS ovate, acute, 20 mm long, connate for 3 mm, sky blue; ovary subcylindric. Pl. I, fig. 5: Leaf x 1.

BRAZIL: AMAZONAS: Rio Caubouris, 1967, Margaret Mee s. n. (US, type; National Geographic Society, original painting).

At the wish of Mrs. Margaret Mee, this new species is dedicated to the memory of the late Rino Levi, whose enthusiasm for discovering and cultivating Brazilian flowers has been a constant inspiration to his friends.

PITCAIRNIA

(Supplement to revision in Phytologia 10: 1. 1964)

124a. P. MARNIER-LAPOSTOLLEI L. B. Smith, sp. nov. A P. billbergioide L. B. Smith scapi vaginis pectinato-serratis differt.

PLANT stemless, flowering ca. 3 dm high. LEAVES rosulate; blades dimorphic, some reduced to slender dark spines, others foliaceous, deciduous, linear, attenuate, ca. 5 dm long and 20 mm wide (! photo), green on both sides, entire at least above the line of abscission. SCAPE straight, slender, sparsely white-flocculose; scape-bracts strict, imbricate but slightly exposing the scape, ovate, attenuate, pectinate-serrate with dark spines. INFLORESCENCE simple, densely ellipsoid, few-several-flowered. FLORAL BRACTS erect, straight, ovate, acuminate, much exceeded by the sepals, sparsely white-flocculose; flowers subsessile, erect. SEPALS triangular-ovate, attenuate, 36 mm long, the posterior ones alate-carinate; petals 8 cm long, linear, acute, red, about equaling the erect stamens but recoiling and exposing them; ovary 4/5 superior; ovules caudate. Pl. I, fig. 6: Scape and inflorescence x 1/2; fig. 7: Posterior sepal x 1.

PERU: Without further locality, cultivated at Jardin Botanique "Les Cèdres," St-Jean-Cap-Ferrat, France, March 1968, J. Marnier-Lapostolle s. n. (US, type).

PUYA

(Supplement to revision in Phytologia 10: 454. 1964)

When I revised Pitcairnia in Phytologia 10: 1. 1964, I kept there P. ferruginea and P. nana on the basis of their slightly inferior ovaries and P. mirabilis on account of its somewhat

zygomorphic flowers. However, Puya can not be characterized by completely superior ovaries, and the really significant characters appear to be the twisting together of the petals after anthesis and the winged seed. The transfer of all three to Puya is as follows:

28a. P. FERRUGINEA (R. & P.) L. B. Smith, comb. nov. Pitcairnia ferruginea R. & P. Fl. Peruv. 3: 36. 1802; L. B. Smith, Phytologia 10: 29. 1964.

62a. P. MIRABILIS (Mez) L. B. Smith, comb. nov. Pitcairnia mirabilis Mez, Fedde Rep. Nov. Spec. 3: 6. 1906; L. B. Smith, Phytologia 10: 30. 1964. Pitcairnia mirabilis Mez var. tucumana Castellanos, Anal. Mus. Nac. Hist. Nat. Buenos Aires 36: 53, pl. 5. 1929. (A size variant whose former distinction has been erased by subsequent intermediates).

48a. P. NANA Wittm. Mededeel Rijks Herb. 29: 85. 1916. Pitcairnia nana (Wittm.) L. B. Smith, Phytologia 7: 5. 1959; 10: 30. 1964.

33a. P. SIMULANS L. B. Smith, sp. nov. A P. thomasi André, cui valde affinis, statura minore, foliis e magna parte retrorse spinosis, bracteis florigeris acuminatis differt.

PLANT short-caulescent, flowering ca. 1.8 m high. LEAVES 9 dm long; sheaths suborbicular, 2 cm long, pale-lepidote and serrulate toward apex; blades 4 cm wide, minutely brown-lepidote between the nerves beneath, glabrous above, laxly serrate with broad nearly black often retrorse spines 8 mm long. SCAPE elongate, exceeding the leaves; scape-bracts small and inconspicuous, long-acuminate from a broadly ovate base. INFLORESCENCE laxly bipinnate, covered with a pale tomentum except for the petals; primary bracts broadly ovate, acuminate, much shorter than the naked sterile bases of the branches; branches subaxillary many-flowered, the lateral subspreading, to 23 cm long, the terminal longer and with stouter rachis. FLORAL BRACTS broadly ovate, much exceeded by the sepals, soon glabrous, acute or the lowest of the terminal branch acuminate; flowers suberect; pedicels very short and stout, obconical. SEPALS broadly ovate, acute, ca. 25 mm long, ecarinate, coriaceous; petals 4 cm long; stamens included. Pl. I, fig. 8: Leaf-margin x 1; fig. 9: Floral bract and flower x 1.

PERU: LIBERTAD: Rocky slope, Munmalca, Hacienda Cochabamba, Huamachuco, alt. 3200 m, 26 June 1958, Lopez & Sagastegui 2815 (US, type; TRP).

2a. P. TROLLII L. B. Smith, sp. nov. A P. spathacea (Griseb.) Mez, cui valde affinis, pedicellis longioribus ad apicem versus incrassatis bracteis florigeras subduplo superantibus differt.

PLANT known only from fragments, but certainly much more than 1 m high. LEAVES over 7 dm long; blades ca. 2 cm wide, covered with pale appressed scales beneath, laxly serrate with dark an-

trorse spines 2 mm long. SCAPE unknown. INFLORESCENCE amply bipinnate, lax, soon glabrous, the fine white stellate trichomes uniform and completely deciduous; primary bracts ovate, acuminate, much shorter than the sterile bases of the branches; branches subspreading, to 26 cm long, laxly flowered. FLORAL BRACTS broadly ovate, apiculate, mostly about half as long as the pedicels, thin, nerved, entire; flowers spreading; pedicels slender but strongly enlarged upward, to 20 mm long. SEPALS oblong, rounded, 15 mm long, carinate toward base, sulcate when dry; petals ca. 3 cm long. Pl. I, fig. 10: Floral bract and flower x 1; fig. 11: Sepal x 1.

BOLIVIA: POTOSI: Thickets at edge of forest, Montecanto, 19° 31' S, 64° 09' W, 24 November 1927, Troll 661 (M, type; US, photo).

TILLANDSIA

T. TURNERI Baker var. *PATENS* L. B. Smith, var. nov. A var. turneri inflorescentia elongata sublaxa, spicis patentibus differt.

Inflorescence subcylindric, sublax, 30 cm long; branches spreading.

VENEZUELA: TACHIRA: On small tree in dense tangled dwarf forest, above Quebrada de Las Copas, headwaters of Río Quinimarí, 35 km south of Alquitrana, alt. 2600-2630 m, 13 January 1968, Steyermark & Dunsterville 100872 (VEN, type; US, photo).

Plate I



Fig. 1-3: *Navia robinsonii*; 4: *N. lepidota*; 5: *Neoregelia leviana*; 6, 7: *Pitcairnia marnier-lapostollei*; 8, 9: *Puya simulans*; 10, 11: *trollii*.

A NEW SPECIES OF ANANAS FROM VENEZUELA

Felisberto Cardoso Camargo

Fundação de Amparo à Pesquisa, São Paulo, Brasil

and

Lyman B. Smith

Smithsonian Institution, Washington, D. C., U. S. A.

In the course of a twelve month tour of entomological and botanical research in Tropical America, the senior author discovered the following new species of Ananas in Venezuela. The junior author agrees that its position in his system is based on its combination of retrorse foliar and bracteal spines and on its infundibuliform petal-scales.

ANANAS PARGUAZENSIS Camargo & Smith, sp. nov.

A A. fritzmuelleri Camargo petalorum ligulis binis infundibuliformibus et ab omnibus speciebus alteris foliorum spinis basalibus retrorsis differt.

Folia 16-19, ca. 1.4-1.6 m longa; laminis 35-45 mm latis, ad apicem basinque versus attenuatis, subtus lepidibus albis adpressis vestitis, supra mox glabris, earum spinis basalibus retrorsis, 3 mm longis, alteris antrorsis. Scapus gracilis, elongatus, plerumque decumbens. Inflorescentia pauciflora, subglobosa, fructificante 4-10 cm longa; comae bracteis foliaceis ad 3 dm longis, earum spinis basalibus retrorsis. Bractee florigerae late ovatae, in apicem pungentem attenuatae, ovaria obtegentes, dense serrulatae. Sepala asymmetrica, inermia, ca. 7 mm longa. Petalis ligulis binis infundibuliformibus praedita.

Type: Angelita, region of Parguaza, affluent of the Río Orinoco, Bolívar, Venezuela, 16 June 1966, Camargo 3 (Herbário Nacional Colombiano no. 103328).

The drawing of the type by Miss Alice R. Tangerini is an exact reproduction of the specimen from which a number of the median bracts of the coma were removed to facilitate drying.

Plate I

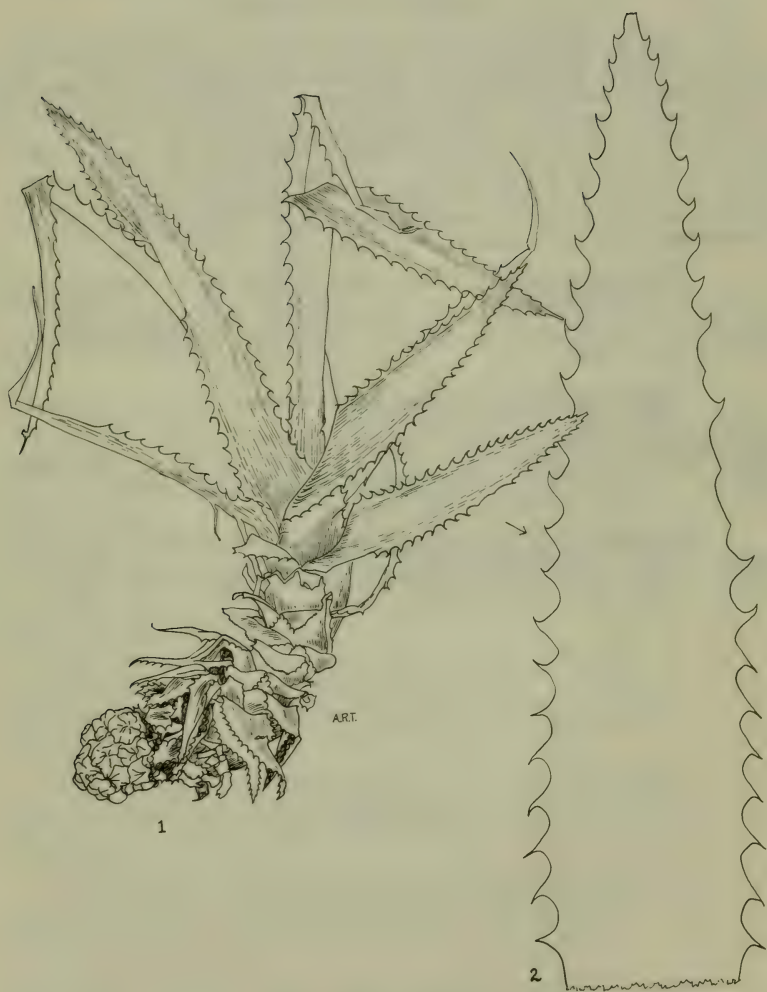
*ANANAS PARAGUAYENSIS* Camargo & Smith

Fig. 1: Frutescence x 1/4; 2: Blade of foliaceous bract x 1.

INDONEESIELLA - A SUBSTITUTE NAME IN ACANTHACEAE

C. P. Sreemadhavan (Calcutta)

Dr R. Grolle of the Institut für Spezielle Botanik der Friedrich-Schiller-Universität, Jena has very kindly drawn my attention to the validly published generic name Neesiella Schiffn. (1893) of Marchantiaceae (Hepaticae). Hence, my usage of this name for a new genus in the family Acanthaceae has created a later homonym. Indoneesiella is proposed as an avowed substitute, and consequent re-combinations are made:

Indoneesiella Sreem. nom. gen. nov. Neesiella Sreem. in Phytologia 15: 270, 1967, non Neesiella Schiffn. in Engler & Prantl, Natürl. Pflanzenfam. I, 3(1): 32, 1893.

Indoneesiella echioides (Linn.) Sreem. comb. nov. Justicia echioides Linn. Sp. Pl. 16, 1753. Andrographis echioides (Linn.) Nees in Wall. Pl. As. Rar. 3: 117, 1831. Neesiella echioides (Linn.) Sreem. in Phytologia 15: 271, 1967.

Indoneesiella longipedunculata (Sreem.) Sreem. comb. nov. Neesiella longipedunculata Sreem. in Phytologia 15: 271, 1967.

A LIST OF LOCALITIES BOTANIZED IN PANAMA

By John D. Dwyer

St. Louis University & Missouri Botanical Garden

The following is a list of localities in which botanists have collected in the Republic of Panama. The names of the botanists are included. The provinces in which the localities are found are designated by the following abbreviations.

B - Bocas del Toro
CH - Chiriquí
CO - Coclé
COL - Colon
CZ - Canal Zone
D - Darién
H - Herrera
L - Los Santos
P - Panama
S - San Blas
V - Veraguas

In 1964 I discussed the history of plant collecting in Panama (Ann. Missouri Bot. Garden 61: 109-117). It must be borne in mind that the Canal Zone was instituted in the 20th century and that the 19th century collectors like Sutton Hayes botanized extensively in the future Canal Zone area. With the establishment of Gatún Lake certain collecting areas, e.g. Matachin disappeared under water. On the other hand Barro Colorado Island arose as an island as a product of the same flooding.

The very recent plant collections in Panama of Kurt Blum, Kenton Chambers, James Duke, John Dwyer and his students, John Ebinger, Joseph Kirkbride, Walter Lewis and his students, Sydney McDaniel, William Stern, and Edwin Tyson are noteworthy.

A noteworthy but minor point is that Paul Standley, the author of the Flora of the Panama Canal Zone (Contr. U.S. Nat. Herb. 27:1-386, 1928) consistently misspelled Tocumen as Tecumen.

I wish to acknowledge the assistance of the U.S. Army Tropic Test Center (Miraflores Annex), Canal Zone and that of WEPOR (Weather Engineers Corporation of Panama).

Abalaba (P) - Killip

Achiote (El Achiote) (COL) - Blum; Correa; Dressler; Dwyer; Tyson

Achituppu (S) - Dwyer; Elias; Lewis; Solís

Agua Clara (P) - Standley

Agua Clara Reservoir (CZ) - Pittier

Agua Frio (D) - Duke

- Aguadulce (CO) - Allen; McCorkle; Pittier; Schery; Steyermark; Stimson; Woodson
Aguarubia (CZ) - Killip
Agua Salud (CZ) - Cook; Martin
Ahorca Largato (CZ) - Cowell; Powell
Ailigandi (S) - Duke; Dwyer; Elias; Lewis; Solís
Alanje (CH) - McCorkle
Albrook (CZ) - Blum; Correa; Dwyer; Hayden; Robyns; Stimson; Tyson
Alconoroque Swamp (D) - Duke
Alhajuela (P) - Allen; Cornman; Dodge; Pittier; Steyermark
Almirante (B) - Barrus; Chambers; Cooper; McDaniel; Seibert; Skutch; Slater; Stern
Alto de Las Palmas (CH) - Pittier
Alto Lino (CH) - Bro. Maurice
Ancón (CZ) - Bro. Celestine; Bro. Maurice; Duke; Dunn; Harvey; Hitchcock; Hayden; Johansen; Lindsay; Mason; Maxon; Piper; Seemann; Seibert; Tyson; Williams; Woodson
Antón (CO) - Allen; Blum; McCorkle; Seibert; Tyson; Woodson
Arenoso (P) - Seibert
Arenoso (D) - Seibert
Arraiján - Allen; Cook; Duke; Martin; Pittier; Seibert; Woodson
Asnati (D) - Duke

Bahia de Piñas (Pinas Bay) (D) - Chambers; Seemann; Stern
Bahia Honda (L) - Elmore
Bailamonas (P) - Stevens
Bajo Boquete (CH) - Killip
Bajo Chorro (CH) - Davidson; Schery; Seibert; Woodson
Bajo Mono (CH) - Allen
Balboa (CZ) - Bro. Gervasius; Correll; Featherstone; Greenman; Greenman; Howe; Seibert; Standley; Tyson
Balboa Heights (CZ) - Hunter
Bald Hill (P) - Erlanson
Bambita (CH) - Allen
Bambita Woods (CH) - White
Barbacoas (CZ) - Hayes
Bar Mouth (B) - Dunlap
Barranco (CO) - Pittier
Barro Colorado Island (CZ) - Abbey; Aviles; Bailey; Bailey; Bangham; Brown; Carleton; Chardon; Chickering; Croat; Faull; Frost; Dressler; Duke; Dwyer; Fairchild; Hayden; Hood; Hunnewell; Kenoyer; Knight; McDaniel; Netting; Nolla; Robyns; Salvoza; Shattuck; Standley; Starry; Stimson; van Tyne; Wetmore; Wilson; Woodworth; Zetek

- Baru (CH) - McCorkle
Bastimentos (B) - von Wedel
Bay of Ardita (D) - Seemann
Bay of Limon (P) Johnston
Bejuco (P) - Allen; Blum; Dwyer; Schery; Tyson; Woodson
Bellevista (P) - Killip; Macbride; Salvoza
Betania (P) - Llana; Young
Big Bight (B) - von Wedel
Bismark (CO) - Williams
Black Swamp (CZ) - Christopherson
Boca Chica (CH) - Pittier
Boca de Cupé (D) - Allen; Chambers; Dwyer; Duke; Pittier;
Stern
Bocas del Toro (B) - Carleton; Dwyer; Elias; Lewis; von Wedel
Bocas de Panarando (D) - Chambers; Dwyer; Ebinger; Pittier;
Stern
Boca de Tesca (D) - Pittier
Boca de Paya (D) - Chambers; Dwyer; Ebinger; Stern
Bodega Bay (P) - Duke
Bohio (CZ) - Maxon; Killip
Bohio Soldado (P) - Cowell
Bohio Station (CZ) - Hayes
Boqueron (CH) - Allen; Hunter; Steyermark
Boquete (cf. El Boquete)
Boy Scout Camp Road (Madden Dam Road) (CZ) - Baker; Dwyer;
Elias; Hayden; Kirkbride.
Brazos Brook Reserve (CZ) - Stevens
Brujas (B) - Mell
Buenas Aires (P) - Blum; Dwyer; Tyson
Buena Vista (B) - Cooper; Duke; Kirkbride

Caballo (P) - Allen; Dodge; Steyermark
Cabuya (P) - Allen
Caimito Hill (CZ) - Pittier
Caldera (CH) - Pittier
Callejon Seco (CH) - Schery; Woodson
Camino de la Granja (P) - Bro. Heriberto
Camino del Boticario (P) - Pittier
Camino El Potrero (CH) - Pittier
Camp Aguacatal (CH) - Maxon; Pittier
Campamento Buena Vista (D) - Chambers; Dwyer; Ebinger; Stern
Camp Pina (COL) - Allen; Duke
Campana Hill (vic Cerro Campana) (P) - Allen
Camp Summit (D) - Blackwell; Nowicke; Oliver.
Camp Ortiga (D) - Duke
Camp Morti Hydro (D) - Duke
Camiseta (CH) - Terry
Cana (D) - Chambers; Dwyer; Ebinger; Goldman; Stern; Williams
Cana Cuasi Trail (D) - Duke; Kirkbride; Terry; Terry.
Canasco (CH) - Chambers; Stern
Canas Cordas (CH) - Pittier

- Cañasas (P) - Duke
Cañazas (V) - Allen; McCorkle; Tyson
Cañazo (B) - Cooper; Slater
Cañdelaria (L) - Duke
Cañgandi (S) - Duke
Caño Quebrado (CZ) - Pittier
Capira (P) - Allen; Bro. Paul; Duke
Capitana (P) - Pittier
Cárdenas Creek (CZ) - Tyson
Careening Cay (B) - von Wedel
Casa Larga (CZ) - Allen; Dodge
Casita Alta (CH) - Allen; Schery; Seibert; Woodson
Cativál (COL) - Standley
Cativo Swamp (D) - Duke
Cermeno (P) - Blum; Dwyer; Robyns; Tyson; Zetek
Cerro Azul (P) - Allen; Baker; Blum; Buchanin; Burch;
Correa; Dressler; Duke; Dwyer; Gauger; Hayden;
Hawker; Hutchinson; Lewis; Stimson; Tyson
Cerro Campana (P) - Allen; Baker; Blum; Burch; Correa;
Dressler; Duke; Dwyer; Ebinger; Hayden; Kirkbride;
Lewis; MacBryde; Maniotis; McDaniel; Oliver;
Stimpson; Strain; Tyson
Cerro Caracoral (CO) - Duke; Kirkbride
Cerro Campamiento (D) - Duke; Kirkbride
Cerro Copete (CH) - Allen; Schery; Woodson
Cerro de Garagará (D) - Pittier
Cerro de la Plata (CH) - Pittier
Cerro Flor (CH) - Allen
Cerro Galero (CZ) - Chambers; Stern
Cerro Galera Chorchá (CH) - Allen
Cerro Gordo (CZ) - Pittier; Standley
Cerro Grande (L) - Baker; Duke; Lewis; MacBryde; Oliver
Cerro (de la) Horqueta (CH) - Blum; Correa; Duke; Dwyer;
Elias; Escobar; Hayden; Kirkbride; Oliver; Pittier
Cerro Jefe (P) - Allen; Baker; Correa; Crebs; Dodson;
Dressler; Duke; Dwyer; Gauger; Godfrey; Hayden;
Kirkbride; Loftin; Odum; Stimson; Tyson
Cerro Luisa (CZ) - Chambers; Stern
Cerro Pajita (CO) - Allen
Cerro Pando (CH) - White
Cerro Pirre (D) - Bristan; Duke; Elias; Goldman
Cerro Prieta (L) - Baker; Lewis; Macbryde; Oliver
Cerro Pilón (L) - Correa; Duke; Dwyer; Kirkbride; Lallathin
Cerro Punta (CH) - Allen; Blum; Chambers; Ebinger; Graham;
McCorkle; McDaniel; Olson; Rasmussen; Ridgway;
Seibert; Solís; Stern; Weston
Cerro Santa Rita (COL) - Allen
Cerro Trinidad (P) - Allen; Duke; Kirkbride
Cerro Turega (CO) - Allen; Schery; Woodson
Cerro Tuté (V) - Allen; Dwyer
Cerro Vaca (CH) - Pittier

- Cerro Valle Chiquito (CO) - Seibert
Chamé (P) - Allen; Dodge; Hunter; Steyermark
Changuinola (B) - Carleton; Cooper; Duke; Dunlap; Dwyer;
Elias; Godfrey; Kirkbride; Lewis; Oliver; Robertson;
Slater
Changuinola Valley (B) - Dunlap; Elias; Stork
Chepigana (D) - Pittier; Terry; Terry
Chepo (P) - Allen; Dodge; Duke; Hunter; Kluge; McCorkle;
Pittier; Sempile; Steyermark
Chica (P) - Allen; McCorkle
Chico (P) - Allen; Steyermark
Chilibre (P) - Dwyer; McCorkle; Seibert; Stimson
Chiman - Correa; Dressler; Lewis; Oliver; Ridgway; Robyns
Chiquero (CH) - Davidson
Chiriquicito (B) - Escobar; Lewis; MacBryde; Oliver; Ridgway
Chiriquí Viejo (CH) - White; White
Chitré (H) - Allen; Blum; Burch; Chambers; Correa; Dwyer;
McCorkle; Oliver; Robertson; Stern; Stimson; Tyson
Chiva-Chiva (Chivi-Chivi) Trail (CZ) - Cornman; Correa;
Killip; Piper; Standley
Chorrera (cf. La Chorrera)
Chucunagi (D) - Duke
Cienaga El Mangle (H) - McDaniel
Cienaga Juncalillo (H) - McDaniel
Claritz (D) - Duke
Cocalito (D) - Dwyer
Cocoa Bay (B) - von Wedel
Cocoa Cay (B) - von Wedel
Cocolí (CZ) - Burch; Correa; Dwyer; Elias; Lewis; Oliver;
Riley; Robertson
Cocoli Island (CZ) - White
Colón (COL-CZ) - Blum; Dwyer; Hayes; Hitchcock; Lehmann;
Kuntze; Moldenke; Riley; Rose; Tyson
Columbus Island (Isla de Colon) (B) - von Wedel; Skutch
Cocos (B) - Cooper
Cocos (CH) - Chambers; Stern
Coco Solo (CZ) - Correa; Duke; Dwyer; Elias; Kirkbride;
Standley; Stimson
Comarca del Barú (CH) - Chambers; Dwyer; Ebinger; Stern
Concepción (CH) - Allen; Burch; Ebinger
Congor Hill (P) - Allen
Contractors Hill (CZ) - Correa; Dwyer; Stimson
Continental Divide (Chiriqui Trail) (B & CH) - Duke;
Kirkbride
Coronado Beach (P) - Duke
Corozal (CZ) - Allen; Bro. Gervasius; Bro. Heriberto;
Dwyer; Greenman; Greenman; Killip; Standley; Tyson
Correa (H) - McDaniel
Corso (P) - Oliver
Corteza (CO) - Pittier
Cricamola (B) - Cooper
Cricamola Valley (B) - Cooper; Pittier

Criolla (B) - Duke; Kirkbride
Crist (D) - Terry
Cristóbal (CZ) - Artamanoff; Cook; Hitchcock; Martin; Pittier
Salvoza

Crucos de Churuc (CO) - Pittier
Cuadi (S) - Duke
Cucaracha (CZ) - Pittier
Cuesta de Cerro Quemado (CH) - Maxon; Killip
Cuesta de la Horqueta (CH) - Pittier
Cuesta Grande (D) - Maxon
Cuesta de Piedra (CH) - Terry
Cuseta de Quiel (CH) - Pittier
Culebra (CZ) - Cowell; Hitchcock; McCorkle; Pittier
Culebra Island (CZ) - Duke; Hayes
Curundú (CZ) - Blum; Correa; Dwyer; Harvey; Loftin; McDaniel;
Tyson

Darién (CZ) - Standley
Darién Station (CZ) - Standley
David (CH) - Burch; Dwyer; Elias; Escobar; Hitchcock; Lewis;
Oliver; Pittier; Robertson
Daytonia Farm (B) - Cooper
Diabolo Heights (CZ) - Robyns; Welch
Divisa (H) - Allen; Dwyer
Dolega (CH) - Dwyer; Hitchcock
Dos Bocas (COL) - Pittier
Dos Milla (B) - McDaniel
Dubaganalla (S) - Duke

East Ridge (East Santa Rita Ridge) (COL) - Correa; Duke;
Dressler; Dwyer

El Boqueté (or simply Boqueté) (CH) - Allen; Chambers; Cornman
Davidson; Duke; Dwyer; Ebinger; Elias; Escobar; Eyde;
Hayden; Hitchcock; Kirkbride; Lewis; Little; McCorkle;
Oliver; Stern; Woodson

El Cope (CO) - Correa; McCorkle

El Cope (V) - McCorkle

El Congor Hill (P) - Allen; Hunter

El Real (D) - Allen; Chambers; Duke; Dwyer; Ebinger; Oliver;
Stern

El Llano (P) - Duke; Tyson

El Hato del Volcán (CH) - Chambers; Ebinger; Roberts; Stern

El Palorín (P) - Bro. Heriberto

El Pedregal (P) - Llana; Wendland

El Pedregal de David (CH) - Pittier

El Potrero (CH) - Dodge; Hunter; Maxon

El Valle de Antón (or simply El Valle) (CO) - Allen; Bartlett
Blackwell; Duke; Dwyer; Hawker; Hunter; Lallathin;
Lasser; Lewis; Martin; McDaniel; McCorkle; Miller;
Nowicke; Oliver; Ridgway; Robyns; Seibert; Verhoeck

El Vigía (CZ) - Allen; Dodge; Pittier; Steyermark

El Volcán de Chiriquí (El Volcán) (CH) - Allen; Davidson;
Duke; Hitchcock; Killip; Little; Seibert; McCorkle;
Steyermark; Terry; Terry; Tyson; Warsewicz; Woodson

- Empire (CZ) - Crawford; Hayden; Hitchcock; Miller; Piper;
Standley
Eneida (P) - McCorkle
Ensenada Guayabo (D) - Chambers; Stern
Erwin Island (CZ) - Shannon
Escobal (CO) - McCorkle
Eslogandi (D) - Duke

Farfan Beach (CZ) - Allen; Burch; Chambers; Dwyer; Elias;
Hayden; Hunter; Kirkbride; Lewis; McDaniel; Oliver;
Robertson; Stern; Tyson
Finca Collins (CH) - Blum; Chambers; Dwyer; Hayden;
Kirkbride; Stern
Finca Lérída (CH) - Allen; Schery; Woodson
Finca St. Louis (B) - Allen; Seibert; Woodson
Finca Tomas Arias (CO) - Allen
Fish Creek Hills (B) - Schery; von Wedel
Fort Clayton (CZ) - Blum; Dwyer; Elias; Robyns; Standley;
Stimson; Tyson; Wheeler; Zetek
Fort Davis (CZ) - Garner; Bro. Heriberto
Fort Kobbe (CZ) - Duke; Dwyer; Oliver; MacBryde
Fort Kobbe Road (CZ) - Allen; Seibert; Woodson
Fort Randolph (CZ) - Harvey; Maxon; Standley
Fort San Lorenzo (P) - Burch; Correa; Ebinger; Garner;
Hayden; McDaniel; Stimson; Tyson
Fort Sherman (CZ) - Bailey; Blum; Duke; Dwyer; Hayden;
Robyns; Stimson; Tyson
France Field (CZ) - Blum; Dwyer; Maxon; Standley; Valentine
Frances Arriba School (CH) - Burch; Elias; Escobar; Lewis;
Oliver; Robertson
Frijoles (CZ) - Bro. Heriberto; Cooke; Cornman; Duke; Dwyer;
Ebinger; Hayes; Killip; Martin; Pittier; Standley;
Stevens; Stimson
Fuertes Inlet (CZ) - Shattuck

Galena Point (CZ) - Blum; Dwyer; Robyns
Galera Chorchá (CH) - Allen
Gamboa (CZ) - Blum; Chambers; Greenman; Greenman; Jones;
Maggs; McDaniel; Peterson; Pittier; Robyns; Standley;
Stevens; Tyson
Garachiné (Pointe Garachiné) (D) - Pittier; Seemann
Garey Creek (B) - McDaniel; von Wedel
Gatún (CZ) - Blum; Duke; Dwyer; Goldman; Hayes; Hitchcock;
Johnston; McDaniel; Ostenfeld; Piper; Pittier; Standley;
Tyson
Gatún Lake (CZ) - Bangham; Duke; Johnston; Nielsen; Ostenfeld;
Powell
Gatuncillo (CZ) - Correa; Stevens; Stimson
George Greene Memorial (CZ) - Allen; Dressler; Dwyer; Hayden
Gigante Bay (CZ) - Dodge
Giral (COL) - Blum; Tyson
Goofy Lake (P) - Blum; Burch; Duke; Dwyer; Elias; Lewis;
Nowicke; Odum; Robyns; Tyson; Verhoek

Gorgas Laboratory (CZ) - White
Gorgona (CZ) - Maxon; Pittier; Wagner
Gorgona Beach (P) - Allen; Duke; Seibert; Woodson
Gorgona Reservoir (CZ) - Maxon
Guabala (CH) - Kupfer; Smith; Tyson
Guabito (B) - Chambers; Stern
Gualaca (CH) - Allen; McCorkle
Guanico (L) - Ayensu; Blum; Dwyer; Edye; Stern; Tyson
Guarunta (CO) - von Hagen; von Hagen
Guararé (L) - Allen; Dwyer; Steyermark; Woodson
Guayabo (D) - Duke; Nickerson
Guayabo Chiquita (D) - Chambers; Stern
Guayabito (P) - Smith; Smith

Hacienda La Gorga (P) - Allen; Dodge; Steyermark
Hacienda La Joya (P) - Allen; Dodge; Hunter; Steyermark
Hato del Jobo (CH) - Pittier
Hato del Loro (CH) - Pittier
Hato del Volcan (CH) - McCorkle
Higuerón (CH) - Cooper; Slater
Horconcitos (CH) - Pittier
Howard Air Base (CZ) - MacBryde; Oliver
Huile (CZ) - Smith

Iguana Island (L) - Seemann
Irundi (S) - Duke
Isla Boca Grande (D) - Duke
Isla Casaya (D) - Duke
Isla Chepillo (PA) - Duke
Isla Colón (Columbus Island) (B) - Skutch; von Wedel
Isla de Pedro Gonzales (P) - Allen; Dwyer
Isla de Bayoneta (P) - Dwyer
Isla del Rey (P) - Duke
Isla de Pinos (S) - Elias; Kirkbride
Isla Espiritu Santo (P) - Duke
Isla Mosquito (Sunset Island) (S) - Duke
Isla Parida (CH) - Pittier
Isla Pedro Gonzales (P) - Allen; Duke; Dwyer; Correa
Isla Saboga (P) - Duke
Isla San Miguel (P) - Duke
Islas Contreras (CH) - Pittier
Islas de Secas (P) - Elmore

Jaque (D) - Duke
Johns Creek (B) - von Wedel
Juan Corso (P) - Pittier
Juan Díaz (P) - Cornman; Killip; Pittier; Standley
Juan Franco Racetrack (P) - Standley
Juan Mina (CZ) - Bartlett; Lasser; Piper

- K-2 Road (CZ) - Lewis; Nowicke; Oliver; Robyns; Verhoek
K-6 Road (CZ) - Chambers; Dwyer; Ebinger; Stern
K-9 Road (CZ) - Chambers; Dwyer; Ebinger; Stern
K-15 Road (CZ) - Correa
Konkintoe (B) - Allen; Seibert; Woodson
- La Avena (H) - Burch
La Capitana (P) - Pittier
La Escalera (D) - Duke; Kirkbride
La Exposición (P) - Bro. Heriberto
Lagartero (CZ) - Pittier
Lagarto (COL) - Powell
Lagrimas (D) - Duke
Laguna de Chiriquí (B) - Carleton; Chambers; Hart; Stern;
von Wedel
Laguna de Portala (P) - Pittier
La Honda (L) - McDaniel
La Jagua (L) - Bartlett; Lasser
La Jagua (P) - Bartlett; Lasser
La Loma (CO) - Oliver; Robyns; Verhoek
La Mesa (CO) - Allen; Correa; Duke; Dwyer; Kirkbride;
Lallathin; McGuire
La Mesa (L) - Allen; Seemann
La Mesa (V) - Blum; Tyson
Las Minas (H) - Burch; Duke; Oliver; Robertson
La Palma (D) - Pittier
La Raya de Santa Maria (V) - McCorkle
La Zorra (B) - Duke; Kirkbride
Las Cascadas (CZ) - Pittier; Sianca; Standley
Las Cruces Trail (CZ) - Allen; Hunter; Bartlett; Cornman;
Lasser; Standley
Las Delicias (P) - Carleton
Las Lagunas (CH) - Tyson
Las Lajas (P) - Allen
La Palma (L) - Correa; Stimson
La Pintada (CO) - Allen; Hunter
La Yeguada (V) - McCorkle
Las Liguas Camp (CH) - Pittier
Las Margaritas (CO) - Allen; Seibert; Woodson
Las Lomas (CH) - McCorkle
Las Minas (H) - Ayensu; Duke; Eyde; Stern
Las Palmas (V) - McCorkle
Las Sabanas (P) - Bro. Gervasius; Bro. Heriberto; Bro. Paul;
Standley; Zetek
Las Uvas (P) - Allen; Bartlett; Dressler
La Venta Beach (CO) - Hunnewell; Muenscher
Limon (CZ) - Correa
Limon (L) - Correa
Limon Island (CZ) - Allen
Lincoln Creek (B) - Carleton; Dunlap
Lion Hill (CZ) - Hayes
Llano Bonito (CO) - Seibert

- Llanos Francia (CH) - Chambers; Dwyer; Ebinger; Hayden;
Kirkbride; Stern
Llano de Piedras (L) - Ayensu; Eyde; Stern
Llano del Volcan (CH) - Allen; Fairchild; Hunter
Lobo Creek (B) - von Wedel
Loma Cuasi (D) - Duke
Loma de la Gloria, Fato (COL) - Pittier
Loma del Tigre (CO) - Allen
Loma Larga (CH) - Allen; Seibert; Woodson
Loma Prieta (L) - Baker; Duke; Lewis; MacBryde; Oliver
Loma Sardina (CH) - Allen
Los Pozos (H) - Tyson
Los Santos (L) - Allen; Dwyer; Seibert; Tyson; Woodson
Los Sigüas (CH) - Maxon; Pittier
Lower Cruces - Pittier
- Macaw Hill (B) - von Wedel
Macho de Monte (CH) - Tyson
Macaracas (L) - Blum; Duke; Dwyer; Lewis; MacBryde; McCorkle;
Ridgway; Oliver; Tyson
Madden Dam (CZ) - Allen; Alston; Bartlett; Chambers; Correa;
Dwyer; Ebinger; Elias; Hayden; Kirkbride; Lasser;
Lewis; MacBryde; Bro. Maurice; Oliver; Robyns; Stern;
Stimson
- Malatuppu (S) - Duke
Mamei (Mamei Hill) (CZ) - Pittier
Mandinga Airport (D) - Duke
Mandinga Indigena (S) - Duke
Mangle Dejunco (H) - Allen; Dodge; Steyermark
Mandinga (CZ) - Duke; Hayden; Piper; Pittier; Woods
Manzilla (P) - Hayes
Manzanilla Island (COL) - Bilberg; Hayes
Manene (D) - Duke; Nickerson
Margarita Swamp (CZ) - Maxon; Killip; Valentine
María Chiquita (COL) - Blum; Dwyer; Ebinger
Mariano Creek (B) - von Wedel
Margarita (CO) - Duke; Dwyer
Marraganti (D) - Duke; Pittier; Williams
Maru Towers (CZ) - Johnston
Masambi (CZ) - Maxon
Masambi River (CZ) - Pittier
Masambi Valley (CZ) - Pittier
Matachin (CZ) - Hayes; Kuntze
Mata del Jobito (CH) - Pittier
Matías Hernandez (P) - Pittier; Standley
Maume (CZ) - Wagner
Mindi (CZ) - Hitchcock; Johnston; McCorkle
Mindi Dairy (CZ) - McCorkle
Miraflores (CZ) - Allen; Burch; Chambers; Fairchild; Lewis;
Oliver; Pittier; Robertson; Stern; Stimson
Miraflores Lake (CZ) - White

- Mojinga (CZ) - Allen; Bartlett; Lasser
Monagre Beach (L) - Blum; Burch; Dwyer; Lewis; MacBryde;
McDaniel; Oliver; Ridgway; Robertson; Tyson
Monkey Hill (CZ) - Cowell; Kuntze
Morti' Abajo (D) - Duke
Morti' Hydro (D) - Duke
Morti' Arriba (D) - Duke
Monte Lirio (CZ) - Christopherson; Maxon; Seibert
Monte Oscuro (P) - Zetek
Mount Chiriquí (CH) - Pfau
Mount Hope (CZ) - Hitchcock
- Nances Cay Island (B) - von Wedel
Nata' (CO) - Allen; Seemann
Nargana (S) - Duke
Naval Ammunition Depot Group 300 Road (CZ) - Chambers;
Stern
Navy Pipeline Road (CZ) - Blum; Chambers; Correa; Dressler;
Smith; Smith; Stimson; Tyson
New Switzerland (CH) - Allen
Nievecita (B) - Allen; Bartlett; Schery; Seibert; Woodson
Nombre de Dios (Fató) (COL) - Pittier
Nuevo Chagres (COL) - Lewis; MacBryde; Oliver
Nuevo Gorgona (P) - Duke
Nuevo Limón (CZ) - Maxon
Nuevo San Francisco (P) - Standley
Nustupo (S) - Dwyer
- Obispo (CZ) - Standley
Ocu' (H) - Allen; Ayensu; Burch; Ebinger; Eyde; Graham; Lewis;
MacBryde; McDaniel; Oliver; Ridgway; Robertson; Stern
Ojo de Agua (P) - Correa
Ola' (CO) - Pittier
Old Bank Island (B) - von Wedel
Orange River (P) - Cornman; Killip
Orange River Valley (P) - Killip
- Paca (D) - Williams
Pacora (P) - Bro. Paul; Allen; Correa; Dressler; Duke;
Dwyer; Killip; McDaniel; Mendez; Seibert; Woodson
Palenque (CO) - Pittier
Palo de Las Letras (D) - Chambers; Duke; Dwyer; Ebinger;
Kirkbride; Stern
Palo Seco (CZ) - Allen; Hunter
Panamá Viejo (P) - Duke; Dwyer; Pease; Porterfield; Riley
Rose; Seemann
Paraíso (CZ) - Dwyer; Hayes
Paredes Islands (CH) - Seemann
Paris (H) - McDaniel
Paso Ancho (CH) - Allen
Paso del Arado (CO) - Pittier
Patino (D) - Duke; Pittier

- Pavon (CZ) - Johnston
 Paya (D) - Chambers; Duke; Dwyer; Ebinger; Kirkbride;
 Stern
 Payita (D) - Chambers; Duke; Dwyer; Ebinger; Kirkbride
 Peach Creek (B) - von Wedel
 Pedasi (L) - Correa; Dwyer; Stimson
 Pedro Miguel (CZ) - Dwyer; Killip; Piper; Pittier
 Pedro Vidal (CZ) - Pittier
 Peluca (P) - Allen; Steyermark
 Peluca Hydrographic Station (CZ) - Allen; Steyermark
 Peña Blanca (La Peña Blanca) (CH) - Schery; Woodson; von
 Hagen
 Peña Prieta (P) - Pittier
 Península de Burica (CH) - Schery; Woodson
 Penonomé (CO) - Allen; Chambers; Dwyer; Ebinger; Lewis;
 MacBryde; McCorkle; Oliver; Ridgway; Stern; Williams
 Perme (S) - Cooper
 Pesé (H) - Allen; Burch; McCorkle; Oliver; Robertson
 Pianista (CH) - Bro. Maurice
 Picacho de Ola (CO) - Pittier
 Pico Pendejo (D) - Duke
 Pidique Peak (D) - Duke
 Piña (COL) - Blum; Dwyer; Johnston; Lewis; MacBryde; Oliver;
 Tyson
 Piña Highland (CZ) - Hayden
 Piña Valley (CZ) - Johnston
 Pinas (D) - Duke
 Pinogana (D) - Allen; Pittier
 Piria (P) - Duke
 Piriaque Island (D) - Chambers; Dwyer; Ebinger; Stern
 Playa Damas (COL) - Pittier
 Playa del Palma (L) - Lewis; MacBryde; Oliver; Ridgway
 Playa de Monagre (L) - Blum; Burch; Dwyer; Lewis; MacBryde; McDaniel;
 Oliver; Ridgway.
 Playa Riomar (P) - Duke
 Pocri (L) - Dwyer
 Pope's Island (B) - Hart
 Porto Bello (Portobelo) (COL) - Bilberg; Christopherson; Dwyer;
 Ebinger; Maxon
 Porto Posado (CO) - Williams
 Potrero (PA) - Dodge; Hunter
 Potrero Muleto (CH) - Davidson; Schery; Woodson
 Progreso (not Progresso) (CH) - Cooper; Slater
 Providence Island (B) - Hart; von Wedel
 Pucra (D) - Dwyer; Ebinger; Stern
 Pucro (D) - Chambers; Duke; Dwyer; Ebinger; Stern
 Pueblo Limón (P) - Smith; Smith
 Pueblo Nuevo (CZ) - McCorkle; Piper; White
 Puerto Armuelles (CH) - Chambers; Schery; Stern; Woodson
 Puerto Obaldía (S) - Pittier

Puente Quemado (D) - Duke
Puerto Palenque (B) - Duke; Kirkbride
Puerto Pilón (COL) - Allen; Correa; Haines
Puerto Piñas (Piñas Bay) (D) - Chambers; Seemann; Stern
Puerto Rosada (CO) - Williams
Puerto St. Dorotea (D) - Dwyer
Pumpkin River (B) - von Wedel
Punta Bruja (CZ) - Stevens
Punta Chame (P) - Hitchcock
Punta Guayabo Chiquita (D) - Chambers; Stern
Punta Guayabo Grande (D) - Chambers; Stern
Punta Mala (L) Stimson; Tyson
Punta Paitilla (P) - Bro. Heriberto; Piper; Standley
Punta Patiño (D) - Duke; Pittier
Punta Pena (B) - Escobar; Lewis; MacBryde; Oliver; Ridgway

Qualca (CH) - Pittier
Quarry Heights (CZ) - Dwyer
Quebra Nigua (B) - von Wedel
Quebracho (CZ) - Christopherson
Quebrada Ancha (P) - Allen; Dodge; Steyermark
Quebrada Bonita (CZ) - Allen; Dodge; Steyermark
Quebrada Chiquero (CH) - Woodson; Schery
Quebrada Chuito (D) - Chambers; Dwyer; Ebinger; Stern
Quebrada Culebra (CZ) - Allen; Dodge
Quebrada de Oro (CZ) - Wheeler; Zetek
Quebrada Fea (CZ) - Allen; Dodge
Quebrada Félix (D) - Chambers; Dwyer; Ebinger; Stern
Quebrada Gutierrez (B) - Duke & Kirkbride
Quebrada Higuera (B) - Duke & Kirkbride
Quebrada Huron (B) - Duke; Kirkbride
Quebrada Honda (D) - Pittier
Quebrada La Palma (CZ) - Allen; Dodge
Quebrada López (CZ) - Allen
Quebrada Lukulon (B) - Duke; Kirkbride
Quebrada Maskia (D) - Duke
Quebrada Melgada (CZ) - Steyermark
Quebrada Menaco (B) - Duke; Kirkbride
Quebrada Morito (CZ) - Johnston
Quebrada Nigua (B) - von Wedel
Quebrada Pura (CZ) - Allen; Steyermark
Quebrada Salamanca (CZ) - Allen; Dodge; Hunter; Steyermark
Quebrada Seco (CH) - Duke; Kirkbride
Quebrada Schungik (B) - Duke; Kirkbride
Quebrada Teeglo (B) - Duke; Kirkbride
Quebrada Tranquilla (CZ) - Allen; Dodge
Quebrada Uvital (D) - Duke
Quebrada Velo (CH) - Woodson; Schery
Quiel (CH) - Pittier

Red Tank (CZ) - Harvey; Maxon; Piper
Refugio (D) - Duke
Remedios (CH) - Allen; Seemann
Río Abajo (P) - Bartlett; Lasser; Pittier

- Río Aguardiente (CZ) Maxon
Río Agua Salud (CZ) - Piper
Río Ailigandi (S) - Duke
Río Antón (CO) - Allen; Hunter
Río Acuati (S) - Duke
Río Areti (D) - Duke
Río Azote Caballo (CZ) - Allen; Dodge; Steyermark
Río Balsa (D) - Duke
Río Bayano (D & P) - Duke; Pittier
Río Biarra (B) - Seibert
Río Boquerón (P) - Allen; Hunter; Steyermark
Río Cabra (P) - Bro. Maurice
Río Caldera (CH) - Corman; Killip; Pittier
Río Canales (D) - Duke; Knight; Sexton
Río Cañazas (P & V) - Allen; Duke
Río Canclones (D) - Duke
Río Canita (P) - Duke
Río Capiñi (P) - Baker
Río Chagres (CZ) - Allen; Babbitt; Blackwell; Blum; Curry;
Duke; Dwyer; Fairchild; Fendler; Hawker; Lewis; Little;
MacBryde; Nowicke; Oliver; Robyns; Tyson
Río Changuinola (B) - Dwyer; Elias; Lewis; Robertson
Río Charare (P) - Pittier
Río Charco-Espiritu (P) - Duke
Río Chavare (P) - Pittier
Río Chico (D & P) - Allen; Duke; Burch; Killip; Oliver;
Solis
Río Chico (CO) - Blum; Tyson
Río Chilibre (P) - Piper; Seibert
Río Chinilla (P) - Maxon
Río Chiriquí (CH) - Allen; Seibert; McCorkle; Woodson
Río Chiriquí Viejo (CH) - Allen; Duke; Hunter; Little; White
White
Río Chucunaque (D) - Chambers; Duke; Dwyer; Ebinger; King
Leopold; Stern
Río Cocolí (CZ) - Chambers; Dwyer; Ebinger; Riley; Stern;
White
Río Concepcion (V) - Croat; Lewis; Hawker
Río Coasi (D) - Duke; Kirkbride
Río Corso (P) - Duke; Oliver
Río Cricamola (B) - Allen; Dwyer; Seibert; Woodson
Río Cuabi (S) - Duke; Robyns; Verhoek
Río Cuasi (D) - Terry; Terry
Río Cucunati (D) - Duke
Río Diablo (S) - Duke
Río Dupi (CH) - Pittier
Río Escucha Ruido (D) - Chambers; Dwyer; Ebinger; Stern
Río Fató (Nombre de Dios) (COL) - Pittier
Río Fonseca (CH) - Pittier
Río Frijol (CZ) - Tyson
Río Gariche (CH) - Seibert
Río Gatuncillo (P) - Allen; Rowlee; Rowlee

- Río Guarumo (CH) - Escobar; Lewis; MacBryde; Oliver; Ridgway;
Seibert
Río Hato (CO) - Blum; Dwyer; Tyson
Río Ibedi (S) - Duke
Río Indio de Gatun (CZ) - Allen; Barbour; Dodge; McCorkle;
Pittier; Steyermark
Río Juan Díaz (P) - Standley
Río Jagua (P) - Allen; Hunter
Río Jenine (P) Duke
Río de Jesús (V) -, Bouche; Dwyer; McCorkle; Seemann
Río Ladrillo (CH) - Maxon; Pittier
Río Kwadi (S) - Duke
Río La Maestra (P) - Allen
Río La Villa (H) - Blum; Dwyer; Tyson
Río Lara (D) -, Duke; Loftin; Tyson
Río Las Lajas (P) - Allen
Río Macho de Monte (CH) - Tyson
Río Maestra (P) - Duke
Río Mamoni (P) - Duke; Pittier
Río Mandinga (S) - Duke
Río Mangle (D) - Duke
Río Marea (D) - Duke
Río Mamonica (P) - Duke
Río Mata Ahogado (CO) - Allen; Martin
Río Mato Puerco (P) - Erlanson; Johnston
Río Media (CZ) - Johnston
Río Medio (CZ) - Miller
Río Membrillo (D) - Duke
Río Morti (D) - Duke
Río Morti Drill Site 7 (D) - Duke
Río Paca (D) - Chambers; Duke; Dwyer; Ebinger; Kirkbride;
Stern
Río Pacora (P) - Duke; Killip; Lewis; MacBryde; Miller; Solis
Río Paraíso (CZ) - Standley
Río Paya (D) - Chambers; Duke; Dwyer; Ebinger; Kirkbride;
Stern
Río Pedregal (L) - Lewis; Nowicke; Ridgway; Robyns; Verhoek;
Zaborowski
Río Pedro Miguel (CZ) - Standley
Río Pequeni (CZ) - Allen; Seemann; Seibert; Steyermark;
Woodson
Río Pequeni (B) - Allen; Fairchild; Seibert; Woodson
Río Perre Cenico (D) - Bristan; Duke; Elias
Río Pescada (P) - Bartlett; Lasser
Río Piarnasta (CH) - Cornman; Killip
Río Piedras (COL) - Blackwell; Dwyer; Lewis; Hawker; Oliver;
Robyns; Verhoek
Río Piña (CZ) - Standley
Río Pirre (D) - Bristan; Chambers; Duke; Dwyer; Ebinger;
Stern
Río Pita (P) - Duke
Río Potrero (P) - Duke

- Río Providencia (CZ) - Blum; Tyson
Río Pucro (D) - Duke
Río Púrio (L) - Dwyer
Río Puente (CZ) - Allen; Dodge; Hunter; Steyermark
Río Punusa (D) - Duke
Río Rovalo (B) - Seibert
Río Sabana (D) - Blum; Duke; Dwyer; King Leopold; Tyson
Río Sambu (D & P) - Duke; Pittier
Río Sancanti (D) - Duke
Río San José (D) - Chambers; Dwyer; Ebinger; Stern
Río San Cristobal (CH) - Tyson
Río Santa María (V) - Allen; Blum; Seemann; Tyson
Río Sirri (CO) - Pittier
Río Subcuti (D) - Duke
Río Tabasará (V) - Allen; Seibert; Woodson
Río Tapia (P) - Duke; Harvey; Hitchcock; Maxon; Standley
Río Tartare (P) - Schery; Woodson
Río Terable (P) - Duke
Río Teribe (Río Terebe) (B) - Dwyer; Elias; Lewis; Robertson
Río Tinta (CH) - Allen; Seibert; Steyermark; Woodson
Río Tonosí (L) - Lewis; MacBryde; Oliver; Ridgway
Río Trinidad (P) - Seibert
Río Tucutí (D) - Duke
Río Tuira (Río Tuyra) (D) - Chambers; Duke; Dwyer; Ebinger; Stern.
Río Tuquesa (D) - Bristan; Chambers; Dwyer; Ebinger; Stern
Río Ucurganti (D) - Bristan
Río Uroganti (D) - Duke
Río Venado (D) - Duke
Río Yapé (D) - Allen; Bristan
Río Yguana (P) - MacBride
Riomar (P) - Duke; Dwyer; Ebinger
Robaldo Trail (B & CH) - Allen
Rodman (CZ) - Dwyer
Rodman Marine Base (CZ) - Blackwell; Nowicke; Hawker

S - 9 Road (CZ) - Correa; Haines
Sabalo (D) - Duke
Sabana de El Boquete (CH) - Pittier
Sabana de Dormisolo (P) - Pittier
Sabana de El Salto (CH) - Maxon; Pittier
Sabana de Marcelito (CZ) - Bro. Heriberto; Pittier
Sabana del Jaguito (P) - Pittier
Sabana del Jobito (CH) - Pittier
Sabanas de la Tortoga (CH) - Pittier
Saboga Island (P) - Duke; Miller
Salamanca (CZ) - Allen; Steyermark
Salto Boquete (CH) - Terry
San Bartolomé (CH) - Schery; Woodson
San Carlos (P) - Allen; Dwyer; Harvey; Roy
San Félix (CH) - Pittier
San Francisco (V) - Dwyer; McCorkle

- San José Island (P) - Andersson; Correa; Duke; Erlanson;
Harlow; Johnston; Stimson
San Lorenzo (CH) - Seemann
San Miguel (P) - Duke
Sansan Swamp (B) - Cooper
Santa Ana (L) - Duke
Santa Catalina (B) - Blackwell; Correa; Ridgway
Santa Clara (CO) - Allen; Dwyer; Ebinger; Seibert; Woodson
Santa Fe (D) - Duke; Dwyer; Loftin; Tyson
Santa Fe (V) - Allen; Ayensu; Dwyer; Eyde; Stern
Santa Isabel (COL) - Pittier
Santa María (CO) - Allen; Pittier
Santa María (H) - Dwyer
Santa Rita (COL) - Correa; Duke; Dressler; Dwyer; Sexton;
Stimson
Santa Rita Hills (P) - Smith; Smith
Santa Rita Trail (CZ) - Cowell
Santa Rosa (CO) - Allen
Santiago (V) - Allen; Dwyer
Sasardi (D) - Duke
Shepherd Island (B) - McDaniel; von Wedel
Shiroyes (B) - Pittier; Tonduz
Sibubi (B) - Carleton
Sibubi Falls (B) - Rowlee; Rowlee
Sixaola Valley (B) - Rowlee; Rowlee
Snapper Point (B) - von Wedel
Sona (V) - Allen; Blum; McCorkle; Purdie; Seibert; Tyson;
Woodson
Sosa Hill (CZ) - Duke; Standley
Sotto Caballo (CZ) - Arranz; Smith; Smith
Sperdi (S) - Pittier
Sumacete (D) - Pittier
Summit (CZ) - Chambers; Duke; Dwyer; Greenman; Greenman;
Lindsay; Muensch; Standley; Stern
Summit (D) - Duke
Summit Garden (CZ) - Blum; Dwyer; Tyson
Sursuba (B) - Dwyer
Suskatupo (S) - Duke; Elias; Kirkbride

Tabernilla (CZ) - Cowell; Hitchcock; Pittier
Taboga Island (P) - Allen; Barclay; Bro. Celestine; Duke;
Dwyer; Hitchcock; Killip; Macbride; Piper; Pittier;
Robyns; Seibert; Sinclair; Standley; Woodson
Taboguilla Island (Isla de Taboguilla) (P) - Duke; Miller
Talamanca (B) - Pittier; Tonduz
Teotuma (D) - Duke
Thatcher Ferry Road (CZ) - Duke
Tocumen (not Tecumen) (P) - Dwyer; Standley
Tolé (V) - Dwyer; Kirkbride; McCorkle; Seemann; Tyson
Tonosi (V) - Ayensu; Blum; Duke; Dwyer; Eyde; Lewis;
MacBryde; Mell; Oliver; Ridgway; Robyns; Stern
Tyson; Verhoek

Toro Point (CZ) - Duke; Hitchcock
 Tortuguilla Cove (CZ) - Johnston
 Trapiche (P) - Allen
 Trapiche Island (P) - Miller
 Tres Bocas (D) - Duke; Kirkbride
 Tucuti (D) - Duke; Terry
 Tuirá (Tuyra) (D) - Chambers; Dwyer; Ebinger; Stern
 Tumaganti (D) - Duke
 Tumba Muerto (P) - Bro. Heriberto; Standley
 Tumba Vieja (COL) - Allen; Dodge; Hunter; Steyermark
 Tusijuanda (D) - Duke

Urava Island (P) - Howe

Valle de Agua Buena (CH) - Pittier
 Venado Beach (CZ) - Correa; Stimson; Welch
 Vera Cruz (P) - Blackwell; Hawker; Lewis; Nowicke; Oliver;
 Robyns; Verhoeck
 Via Brazil No. 55 (P) - Correa
 Victoria Fill (CZ) - Allen
 Viento Frio (COL) - Pittier
 Volcán de Chiriquí Viejo (CH) - Allen

Water Valley (B) - Lucas; Schery; von Wedel
 Western River (B) - von Wedel

Yapé (D) - Allen
 Yaviza (D) - Chambers; Duke; Dwyer; Ebinger; Pittier; Stern
 Zambrano (CH) - Correa; Stimson

COLLECTORS INCLUDED IN THE ABOVE LIST

| | | |
|-------------------|----------------------|------------------|
| Abba, E.C. | Billberg, Johan E. | Christie, W.D. |
| Allen, Paul | Blackwell, W. | Chrysler, M.A. |
| Alston, A.H.G. | Blair, G.E. | Chu, R. |
| Ames, L. | Blum, K. | Clausen, R.T. |
| Andersson, N.J. | Bottimer, L.J. | Cook, O.F. |
| Andre, Floyd | Bridges, Thomas, | Cooper, G.P. |
| Aviles, Silvestra | Bristan, N. | Corman, L.R. |
| Ayensu, E.S. | Brown, E.F. | Cornman, M.A. |
| Bailey, E.Z. | Brown, Marjorie | Correa, A., M.O. |
| Bailey, L.H. | Burch, Derek | Correll, D.S. |
| Baker, C.F. | Calderon, Salvador | Covich, Alan P. |
| Baker, K. | Carleton, M.A. | Cowell, J.F. |
| Ball, C.R. | Carpenter, Frank | Crawford, J.C. |
| Bangham, C.M. | Celestine, Bro. | Crebbs, T. |
| Barbour, W.R. | Chambers, Kenton | Cuming, Hugh |
| Barclay, George | Chardon, P. C.E. | Curry, D.P. |
| Barrios, F.R. | Chickering, A.M. | Dahlin, Emil |
| Bartlett, H.H. | Child, G. | Davidson, A. |
| Behr, H.H. | Christopherson, E.D. | Davidson, G.R.W. |

| | | |
|---------------------|-------------------|----------------------|
| Dodge, C. | Hunnewell, F.W. | Piper, C.V. |
| Dressler, R.L. | Hunter, A.A. | Pittier, H. |
| Duchassaing, E.P. | Hutchinson, P.C. | Popenoe, D.H. |
| Duke, James | Idrobo, J. | Porterfield, W.M. |
| Dunlap, V.C. | Johnston, I.M. | Powell, C.W. |
| Dwyer, J.D. | Kenoyer, L.A. | Pring, G. |
| Ebinger, J. | Killip, E.P. | Pringle, C.G. |
| Elias, T. | Kirkbride, J. | Purdie, W. |
| Elmore, F.H. | Kluge, H.C. | Rasmussen, |
| Eyde, R.H. | Knight, Dennis | Read, Frank A. |
| Epplshheimer, Mrs. | Koch, Alex | Ridgway, J.E. |
| Erlanson, C.O. | Kuntze, C.E.O. | Riley, L.A.H. |
| Escobar, N. | Lallathin, B. | Robertson, Kenneth |
| Fairchild, A.G.B. | Langman, I.K. | Robyns, Andre |
| Faull, J.H. | Lasser, T. | Roever, W.E. |
| Featherstone, Wm. | Leopold III, King | Rose, J.N. |
| Fendler, A. | Lewis, W.H. | Rowlee, H.E. |
| Fosberg, Ray | Lindsay, Walter | Rowlee, W.W. |
| Foster, Robin | Lipscomb, L.J. | Schultes, R.E. |
| Gauger, G. | Little, E. | Seemann, Berthold C. |
| Gallegos, C. | Llana, G.A. | Sinclair, Andrew |
| Gaillard, D.D. | Loftin, H. | Schery, Robert W. |
| Garner, R. | Lonfield, C. | Schupp, W.A. |
| Gervasius, Bro. | Lucas, Allen | Seibert, W.J. |
| Gillespie, J.W. | Macbride, J.F. | Sexton, Owen |
| Goldman, E.A. | MacBryde, Bruce | Shafer, J.A. |
| Godfrey, R. | Maniotis, J. | Slater, George |
| Graham, Shirley | Martin, G.W. | Smith, C.E. |
| Greenman, J.M. | Mason, Charles | Smith, H.M. |
| Greenman, M.L. | Mathias, Mildred | Solis, R. |
| Grisebach, A. | Maurice, Bro. | Standley, Paul |
| Haenke, T. | Maxon, W.R. | Stark, M.C. |
| Haines, B.L. | McCorkle, J.S. | Starry, D.E. |
| Halsted, M.B. | McDaniel, Sydney | Stern, William |
| Harlow, J. | McGuire, B. | Stevens, F.L. |
| Harper, R.A. | Mell, C.D. | Steyermark, Julian |
| Harrison, P.G. | Mendez, A. | Stimson, William |
| Hart, J.H. | Muenschner, W.C. | Stork, H.E. |
| Harvey, D.R. | Miller, Gerrit | Terry, R.A. |
| Hawker, J. | Moldenke, A. | Terry, M.E. |
| Hayden, Sister M.V. | Moldenke, H. | Tonduz, A. |
| Hayes, Sutton | Nee, Luis | Tyson, Edwin |
| Haynes, G. | Netting, Graham | Valerio, Juvenal |
| Henderson, P. | Nickerson, N.H. | Underwood, J.M. |
| Heriberto, Bro. | Odum, H.T. | Valentine, A.T. |
| Higgins, J.E. | Oliver, Royce L. | Verhoek, S. |
| Hitchcock, A.S. | Ostenfeld, C.H. | Vestal, P.A. |
| Hodge, W. | Pastor, H. | von Hagen, Christine |
| Holdridge, L.R. | Paul, Bro. | von, Hagen Wolfgang |
| Howe, C.D. | Petersen, N.F. | Wagner, Moritz |
| Howe, M.A. | Pfau, R. | Woodson, Robert |

von Wedel, H.
Wallace, James
Wallis, John
Warscewicz, Julius von
Weddell, H.A.
Welch, Winona
Wendland, J.C.
Wetmore, R.H.
Wheeler, Morton
White, Gene
White, Peggy
Williams, R.S.
Wilson, C.L.
Woods, Frank
Woodworth, H.
Young, E.
Zaborowski
Zahn, Paul
Zetek, James

I have been unable to find the given name or initials of several collectors; these are: Babbitt; Dawe; Gagelin; Hadamard; Hood; Johansen; Jobbins; Kupfer; Lee; Maggs; Pease; Roy; Sargent; Shannon; Sinclair; Werner; Weston.

A few months ago I remarked on the current status of plant collecting in Panama (Taxon 17: 107-108, 1968): 'The alpine reaches of the Province of Chiriqui have attracted numerous collectors for about a century. The Province of Coclé, especially at El Valle de Antón and Penonomé have drawn a fair number of collectors. Bocas del Toro shows almost fifty localities, but these are mainly in the general area of Almirante and Changuinola, with one collector, H. von Wedel, responsible for 80% of the collection sites. The roadless but river-dissected Province of Darién was poorly collected up to the year 1959. The vigorous botanizing of Dr. James Duke of Battelle Memorial Institute (Columbus, Ohio) over the past five years has changed the situation markedly. The Province of San Blas (or better Comarca de San Blas), especially the hills or low mountains of the mainland is virtually unexplored. The Provinces of Veraguas, Los Santos, and Herrera have been very poorly collected ...'

A NEW SPECIES OF STACHYTARPHETA FROM BRAZIL

Harold N. Moldenke

STACHYTARPHETA CANDIDA Moldenke, sp. nov.

Herba prostrata parva; caulis dense hirsutis; foliis decussato-oppositis sessilibus oblanceolatis rigidiusculis utrinque sparsissime albo-setosis, ad apicem acutis, basin versus cuneatis, margine serrato; inflorescentiis spicatis terminalibus erectis solitariis dense multifloris 9--10 cm. longis 2.5--3 cm. latis ubique dense hirsutis.

Small prostrate herb; stems apparently unbranched, 15--20 cm. long, flat on the ground except for the erect tips, densely hirsute throughout; leaves decussate-opposite, erect, rather rigid, uniformly bright-green on both surfaces, sessile, 3--5.5 cm. long, 1--1.7 cm. wide, acute at the apex, serrate along the margins from about the middle to the apex, cuneate to the base, very sparsely white-setose on both surfaces; venation about equally prominent on both surfaces in an intricate network; inflorescence erect, terminal, solitary, 9--10 cm. long, densely many-flowered, 2.5--3 cm. wide, densely hirsute throughout; peduncles short, mostly about 1.5 cm. long, densely hirsute; flowers widely divergent, imbricate; rachis similar to the peduncle and stem in all respects; bractlets narrow-lanceolate, 1 cm. long, equaling the calyx, densely hirsute, long-attenuate at the apex; calyx tubular, 1 cm. long, densely hirsute outside with white spreading hairs like those on the peduncles and stems, the apex 5-apiculate; corolla white, the tube about equaling the calyx, the limb about 1 cm. wide; pistil 1.5 cm. long, persisting and conspicuous beyond the calyx after the corolla is shed.

The type of this very distinctive species was collected by H. S. Irwin, J. W. Grear, Jr., R. Souza, and R. Reid dos Santos (no. 12393) on a wet campo, at an elevation of 1000 meters, Chapada dos Veadeiros, about 15 km. west of Veadeiros, Goiás, Brazil, on February 9, 1966, and is deposited in the United States National Herbarium at Washington.

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ADDITIONAL NOTES ON THE GENUS VITEX. VII

Harold N. Moldenke

VITEX Tourn.

Additional & emended synonymy: Wilckeia Scop., *Introductio Hist. Nat.* 170. 1777. Macrostegia Nees in A.DC., *Prodr.* 11: 218. 1847 [not Macrostegia Turcz., 1852]. Viiex L. ex Hosokawa, *Journ. Soc. Trop. Agr. Taiwan* 6: 206, sphalm. 1934. Wilkea P. & K. apud

- Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 1194, in syn. 1966.
- Additional & emended bibliography: Adans., Fam. Pl. 2: 12, 196, & 200. 1763; Scop., Introd. Hist. Nat. 170 & 171. 1777; J. F. Gmel. in L., Syst. Nat., ed. 13, pr. 1, 2: 962—963 (1789) and pr. 2, 2: 962—963. 1796; H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 199—200 (1817) and ed. quarto, 2: 245—246. 1818; Pers., Sp. Pl. 3: 359—361. 1819; Steud., Nom. Bot., ed. 1, 888. 1821; Bischoff, Handb. Bot. Term. 1: Erk. Taf. 32, pl. 40, fig. 1691. 1830; Roxb., Fl. Ind., ed. 2 [Carey], 69—75. 1832; Hook. & Arn., Bot. Beech. Voy. 206, pl. 47 & 48 (1836) and 305. 1838; D. Dietr., Syn. Pl. 3: 371. 1843; Bischoff, Organ. Syst. Art. Regist. 23. 1849; Wittst., Etymol.-bot. Handwörterb. 325. 1852; Schnitzl., Icon. Fam. Nat. Reg. Veg. 137. 1856; Mason, Burmah & People, ed. 2, 413, 479, 526, & 792. 1860; Beddome, Forester's Man. Bot. S. Ind. 172. 1873; Gamble, Man. Ind. Timb., ed. 1, 294 & 296—298. 1881; Watt, Econ. Prod. India 5: 294—295 (1883), 6: 191 (1883), and 7: 254 & 255. 1883; W. Robinson, Garden 27: 130. 1885; Vidal, Phan. Cuming. Philip. 134—135. 1885; Watt, Dict. Econ. Prod. India 6 (4): 248—251. 1893; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 1, 1: 59, 77, 296, 297, 304, 447, 529, 582, 619, & 844 (1893), 2: 83 & 308 (1894), and 2: 642, 667, 1036, 1121, & 1213—1214. 1895; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Gamble, Man. Ind. Timb., ed. 2, 539—542. 1902; Prain, Beng. Pl., ed. 1, 2: 823 & 831—833. 1903; Millsp. in Fedde, Repert. Spec. Nov. 7: 285. 1909; A. Chev., Sudania 1: 4, 11, 43, & 71. 1911; Duthie, Fl. Upper Gang. Plain 2: 215, 223—224, & 266. 1911; R. N. Parker, For. Fl. Punjab 394. 1918; Backer, Trop. Natuur 8: 7, fig. 313. 1919; A. Chev., Cat. Pl. Jard. Bot. Saigon 36. 1919; I. Bailey, Ecology 1: 174—189. 1920; Vaughan, Indian Forest. 47: 286—288, pl. 9 & 10. 1921; Nakai, Trees & Shrubs Indig. Jap., ed. 1, 1: 350, fig. 190. 1922; Chopra, Knowles, & Gupta, Indian Med. Gaz. 58: 133. 1924; Gamble, Fl. Presid. Madras 2 (6): 1086 & 1101—1103. 1924; C. J. F. Skottsberg, Medd. Göteborg. Bot. Trädg. 2 [Haw. Vasc. Pl. 1]: 259. 1925; C. Coster, Ann. Jard. Bot. Buitenz. 38: pl. 6, fig. 2. 1928; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 1, 154 & 241. 1932; Bonstedt, Pareys Blumengärtn., ed. 1, 272 & 278. 1932; C. M. King, Proc. Iowa Acad. Sci. 39: 66 & 74, fig. 11. 1932; Hochr., Candollea 5: 191—192. 1934; Hosokawa, Journ. Soc. Trop. Agr. Taiwan 6: 206. 1934; Anon., Ind. Sem. Ofr. Canje Jard. Bot. Montev. 8. 1935; Terazaki, [Illustr. Fl. Jap.] fig. 2499. 1938; Cranwell, Rec. Auckl. Inst. & Mus. 2: 297. 1942; Uphof, Bot. Rev. 8: 569—571. 1942; Rosengurtt, Estud. Prad. Nat. Urug. 5: 394. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 2, 1: 59, 77, 296, 297, 304, 447, 529, 582, 619, & 844 (1946) and 2: 83, 642, 667, 1036, 1121, & 1213—1214. 1946; Sel-ling, Bishop Mus. Spec. Publ. 38: [67], 274, 275, 394, 410, & 411. 1947; Li & Keng, Taiwan 1 (2-4): 127. 1950; Kuck & Tongg, Mod. Trop. Gard. 42, 77, & 236. 1955; H. St. John, Nomencl. Pl. 74. 1958; Cave, Ind. Pl. Chromosome Numb. 1: 46 & 54. 1958; Kitamura & Okamoto, Col. Illustr. Trees & Shrubs Japan 221, pl. 65. 1960; Encke, Pareys Blumengärtn., ed. 2, 2: 446. 1960; Potztal in Encke, Pareys Blumengärtn., ed. 2, 2: 439. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., pr. 3, 1: 59, 77, 296, 297, 304, 447, 529,

- 582, 619, & 844 (1960) and 2: 83, 642, 667, 1036, 1121, & 1213--1214. 1960; Cave, Ind. Pl. Chromosome Numb. 2: 137. 1961; Deb, Bull. Bot. Surv. India 3: 315. 1961; D. Price, Contrib. N. S. Wales Nat. Herb. 3: 194. 1961; Allan, Fl. N. Zeal. 1: 959--960. 1961; M. R. Henderson, Common Malay. Wildfls. 39. 1961; H. F. Mac Millan, Trop. Plant. & Gard., ed. 5, pr. 3, 197, 198, 214, 217, 366, & 529. 1962; R. K. Gupta, Journ. Indian Bot. Soc. 41: 10. 1962; Thothathr., Bull. Bot. Surv. India 4: 291. 1962; Nobuhara, Okada, & Fujihira, Jap. Journ. Ecol. 12: 101--103, 105, & 107. 1962; Veillon, Revist. Forest. Venez. 5: 59, 61, & 66. 1962 Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1055 & 1454. 1962; Maheshwari, Fl. Delhi 281--282. 1963; Prain, Bengal Pl., ed. 2, 2: 621--622 & 1012. 1963; Sharma & Mukhopadhyay, Journ. Genet. 58: 359, 365, 366, 375, 376, 379, 383, & 539, pl. 11, fig. 30 & 31. 1963; Chuang, Chao, Hu, & Kwan, Taiwania 1 (8): 54, 58, & 63, pl. 3, fig. 40. 1963; Jain, Bull. Bot. Surv. India 5: 225 & 356. 1963; Rao, Aggarwal, & Mukherjee, Bull. Bot. Surv. India 5: 146, 309, 311, 315, & 321. 1963; J. Joseph, Bull. Bot. Surv. India 5: 294. 1963; Janardhanan, Bull. Bot. Surv. India 5: 371. 1963; Patil, Bull. Bot. Surv. India 5: 20. 1963; Deb, Bull. Bot. Surv. India 5: 54. 1963; Santapau & Wagh, Bull. Bot. Surv. India 5: 109. 1963; Arora, Journ. Indian Bot. Soc. 42: 41, 42, 50, & 56. 1963; Rios de Moura Baptista, Anais XV Congr. Soc. Bot. Bras. 200. 1964; Duffy, Journ. Appl. Ecol. 1: 227, 228, 231, 234, 242, 243, & 248. 1964; A. Banerjee in Lahiri, West Beng. Forests 56. 1964; R. C. Ghosh in Lahiri, West Beng. Forests 197. 1964; Straatmans, Micronesica 1: 115. 1964; S. V. Ramaswamy, Bull. Bot. Surv. India 6: 10 & 17. 1964; Puri, Jain, Mukerjee, Sarup, & Kotwal, Rec. Bot. Surv. India 19: 107. 1964; Rao & Sastry, Bull. Bot. Surv. India 6: 160, 164, & 281. 1964; Cave, Ind. Pl. Chromosome Numb. 2: 331 (1964) and 2: 438. 1965; Hepper, Bull. Inst. Fond. Afr. Noire 27: 419, 421, & 496. 1965; Schnell, Adansonia 5: 348. 1965; Lamprecht, Revist. Forest. Venez. 7: 107. 1965; Konrad, Revist. Forest. Venez. 8: 70. 1965; Sen & Naskar, Bull. Bot. Surv. India 7: 60. 1965; M. S. Mani, Bull. Bot. Surv. India 7: 114. 1965; Galil, Eizikowitch, & Prosbul, Hort. Bot. Univ. Tel-aviv. Ind. Sem. 1965: 5. 1965; Chopra, Badhwar, & Ghosh, Poison. Pl. India 2: 694 & 695. 1965; Banerji, Rec. Bot. Surv. India 19: 75. 1965; Pitschman, Reisigl, & Schiechl, Fl. Sudalp. 189. 1965; Maheshwari & Singh, Dict. Econ. Pl. India 166. 1965; D. R. Harris, Univ. Calif. Publ. Geogr. 18: [Pl. Anim. & Man Outer Leeward Isls.] 151. 1965; Bose, Handb. Shrubs 96, 97, 119, & 162. 1965; F. A. Barkley, List Ord. Fam. Anthoph. 76, 137, 217, & 219. 1965; Douk, Trav. Lab. Mat. Méd. Pharm. Gal. Paris 50: 1--264. 1965; Galil, Eizikowitch, Prosbul, & Tankus, Hort. Bot. Univ. Tel-aviv. Ind. Sem. 1966: 5. 1966; Polunin & Huxley, Fls. Medit. 154--155. 1966; Chavan & Oza, Mahar. Savaj. Univ. Baroda Bot. Mem. 1: 185 & 187. 1966; B. C. Stone, Micronesica 2: 132. 1966; C. A. Sm., Common Names S. Afr. Pl. 243, 374, 379, 438, 439, 498, & 601. 1966; R. H. Compton, Journ. S. Afr. Bot. Suppl. 6: 156, 177, & 178. 1966; Seikel, Chow, & Feldman, Phytochem. 5: 439--455. 1966; S. V. Ramaswami, Study Flow. Pl. Bangalore [thesis] xxix, 1016, 1027--1031, & 1467. 1966;

J. A. Steyererm., Act. Bot. Venez. 1: 254. 1966; Steyererm. & Agostini, Act. Bot. Venez. 1 (2): 13, 14, & 17. 1966; Anon., Ind. Bibliogr. Bot. Trop. 3 (2): 15. 1966; Panigrahi, Bull. Bot. Surv. India 8: 3, 4, & 11. 1966; Malick, Bull. Bot. Surv. India 8: 55. 1966; Panigrahi & Joseph, Bull. Bot. Surv. India 8: 151. 1966; Airy Shaw in Willis, Dict. Flow. Pl., ed. 7, 32, 205, 245, 408, 654, 684, 687, 770, 932, 944, 1148, 1173, 1176, 1184, 1188, 1193, & 1194. 1966; Matthew, Bull. Bot. Surv. India 8: 164. 1966; Sebastiane & Ramamurthy, Bull. Bot. Surv. India 8: 180. 1966; Balapure, Bull. Bot. Surv. India 8: 190 & 194. 1966; Jain & De, Bull. Bot. Surv. India 8: 247. 1966; Naithani, Bull. Bot. Surv. India 8: 260. 1966; Rao & Rabha, Bull. Bot. Surv. India 8: 301. 1966; J. L. Ellis, Bull. Bot. Surv. India 8: 329 & 337. 1966; Menninger, Bull. Fairchild Trop. Gard. 22 (3): 10. 1967; L. V. Barton, Bibl. Seeds 814. 1967; Anon., Biol. Abstr. 48 (22): S.190. 1967; Nobuhara, Jap. Journ. Bot. 19: 326--328, 330, 332--334, 336--338, 341--345, & 348. 1967; Moldenke, Phytologia 15: 222--232, 240--268, & 304--325. 1967; Moldenke, Résumé Suppl. 15: 2, 4--10, 14--16, 20, 21, & 23--25. 1967; Anon., Quart. Journ. Crude Drug Res. 7: 1066. 1967; Friedrich-Holzhammer in Merxm., Prodr. Fl. Südw. Afr. 122: 1 & 9--10. 1967; J. Jiménez, Archiv. Bot. & Biogeogr. Ital. 43: 16. 1967; Anon., Biol. Abstr. 48 (20): S. 181. 1967; Twisselmann, Wasmann Journ. Biol. 25: 125 & 327. 1967; Guillaum., Mém. Mus. Hist. Nat. Paris B.15: 315. 1967; Fulling, Ind. Bot. Record. Bot. Review 569. 1967; Anon., Biol. Abstr. 48 (23): S. 186. 1967; Litvinenko & Kovalev, Khim. Prirod. Sedin (Tashkent) 3: 56--57. 1967; Moldenke, Biol. Abstr. 48: 10560. 1967; R. R. Stewart, Pakistan Journ. Forest. 17: 515. 1967; Rimpler & Schulz, Tetrahed. Lett. 22: 2033--2035. 1967; Moldenke, Biol. Abstr. 48: 10099. 1967; Rimpler & Schulz, Biol. Abstr. 48: 9253. 1967; J. S. Beard, Journ. Ecol. 55: 277. 1967; Dombrowski & Kuniyoshi, Araucariana 1: 14. 1967; D'Arcy, Rhodora 69: 439. 1967; Ivory, East Afr. Agr. Forest Journ. 32: 393--397. 1967; Seikel, Chow, & Feldman, Biol. Abstr. 48: 9450. 1967; Santa, Nat. Monsp. Bot. 18: 26, 76, & 123, fig. 129 & 130. 1967; Sauer, Plants & Man Seychelles 102. 1967; Soukup, Biota 6: 359. 1967; Santapau, Bull. Bot. Surv. India 8: 39. 1967; Camara & Ciferri, Quaderno 39: 455 & 456. 1967; N. H. A. Cole, Bull. Inst. Fond. Afr. Noire 29: 910 (1967) and 30: 107. 1968; Moldenke, Phytologia 15: 472. 1968; Ivory, Biol. Abstr. 49: 3307. 1968; Moldenke, Biol. Abstr. 49: 851 & 1325 (1968), 49 (2): S.72 & S.186 (1968), 49 (3): S.73 & S. 186 (1968), and 49 (7): S.181. 1968.

It should be noted that the H.B.K. reference dates given above have been authenticated by consultation of the work by Barnhart (1902). The Hooker & Arnott dates given in the same emended bibliography are often cited incorrectly as "1840" and "1841". Actually, pages 193 to 288 and plates 40 to 59 of this work were issued in 1836, while pages 289 to 384 and plates 60 to 79 were issued in 1838.

Encke (1960) describes this genus as follows: "Vitex L., Münchspfeffer (römischer Name für V. agnus-castus). Laubabwerfende, oft aromatische Sträucher und Bäume, mit gegenständigen 3--7

fach gefingerten, selten auf 1 Blättchen reduzierten Blättern. Blüten klein, weiss, blau oder gelblich, in oft rispenartigen Trugdolden. Kelch glockenförmig, oft 5zählig. Krone mit zylindrischen, meist kurzer, gerader, seltener gebogener, nach oben zu etwas erweiterter Röhre. Kronsaum ausgebreitet, schief, schwach zweilappig, 5spaltig. Staubblätter 4, davon 2 kürzer und 2 länger. Frucht eine kleine Steinfrucht, mit einem 4fächerigen Steinkern, umgeben von dem nicht abfallenden Kelch. — Etwa 220 Arten, verbreitet in allen tropischen und subtropischen Ländern."

Barkley (1965) includes Tripinna, Tripinnaria, and Varengevillea among the valid genera of Verbenaceae, but they are all invalid. Litvinenko & Kovalev (1967) tell us that vitexine is found naturally also in Glycyrrhiza glabra.

Scopoli (1777) gives Maillelou of Rheedee as a synonym of his genus Wilckea. The Ephielis of Schreber is a synonym of Ratonia in the Sapindaceae, while the Macrostegia of Turczaninow is actually Pimelea Banks in the Thymelaeaceae. Airy Shaw (1966) erroneously places Macrostegia Nees in the Acanthaceae. Also, he credits the name Ephialum to Wittstein, but that author in his Etymol.-bot. Handwörterb. 325 (1852) plainly credits the name to Solander; similarly Airy Shaw credits Wilckea to "P. & K.", but Post & Kuntze in their Lexicon 593 (1904) plainly credit the name to Scopoli.

Vidal (1885) cites Cuming 686, 1173, 1297, & 1698 as undetermined species of Vitex.

VITEX ACUMINATA R. Br.

Additional bibliography: Steud., Nom. Bot., ed. 1, 888. 1821; Moldenke, Phytologia 15: 224 & 244. 1967; Moldenke, Résumé Suppl. 15: 25. 1967; Moldenke, Biol. Abstr. 48: 10099 (1967) and 49: 1325. 1968.

VITEX AGELAEIFOLIA Mildbr.

Additional bibliography: Moldenke, Phytologia 15: 224—225. 1967; Moldenke, Résumé Suppl. 15: 24. 1967.

VITEX AGELAEIFOLIA var. RUFULA Moldenke

Additional bibliography: Moldenke, Phytologia 15: 225. 1967; Moldenke, Résumé Suppl. 15: 24. 1967.

VITEX AGNUS-CASTUS L.

Additional synonymy: Vitex agnuscastas Bose, Handb. Shrubs 122, sphalm. 1965. Vitex agnescasteus L., in herb. Vitex agnus casteus L., in herb.

Additional & emended bibliography: J. F. Gmel. in L., Syst. Nat., ed. 13, pr. 1, 2: 963 (1789) and pr. 2, 2: 963. 1796; Pers., Sp. Pl. 3: 360. 1819; Steud., Nom. Bot., ed. 1, 888. 1821; Bischoff, Handb. Bot. Term. 1: Erk. Taf. 32, pl. 40, fig. 1691. 1830; Bischoff, Organ. Syst. Art. Regist. 23. 1849; Schnitzl., Icon. Fam. Nat. Reg. Veg. 137. 1856; Gamble, Man. Ind. Timb., ed. 1, 296. 1881;

Watt, Econ. Prod. India 5: 294. 1883; Watt, Dict. Econ. Prod. India 6 (4): 250--251. 1893; Gamble, Man. Ind. Timb., ed. 2, 539 & 542. 1902; Bonstedt, Pareys Blumengärtn., ed. 1, 278 & 279. 1932; C. M. King, Proc. Iowa Acad. Sci. 39: 66 & 74, fig. 11. 1932; Anon., Ind. Sem. Ofr. Canje Jard. Bot. Montev. 8. 1935; Selling, Bishop Mus. Spec. Publ. 38: 274, 275, & 411. 1947; Encke, Pareys Blumengärtn., ed. 2, 446. 1960; Sharma & Mukhopadhyay, Journ. Genet. 58: 359, 366, 376, 379, 383, & 539, pl. 11, fig. 31. 1963; Maheshwari, Fl. Delhi 281--282. 1963; Cave, Ind. Pl. Chromosome Numb. 2: 331. 1964; Pitschman, Reisigl. & Schiechtl, Fl. Sudalp. 189. 1965; Bose, Handb. Shrubs 96, 119, & 122. 1965; Polunin & Huxley, Fls. Medit. 154--155. 1966; Galil, Eizikowitch, Prusbul, & Tankus, Hort. Bot. Univ. Tel-aviv. Ind. Sem. 1966: 5. 1966; Moldenke, Phytologia 15: 225--226, 267, 305, & 309. 1967; D'Arcy, Rhodora 69: 439. 1967; Moldenke, Résumé Suppl. 15: 2, 15, 16, & 24. 1967; Santa, Nat. Monsp. Bot. 18: 26, 76, & 123, fig. 129 & 130. 1967; Twisselmann, Wasmann Journ. Biol. 25: 125 & 327. 1967.

Additional illustrations: Bonstedt, Pareys Blumengärtn., ed. 1, 279. 1932; Bose, Handb. Shrubs opp. p. 73. 1965; Santa, Nat. Monsp. Bot. 18: 123, fig. 129 & 130. 1967.

D'Arcy (1967) tells us that this species is a common ornamental plant on Tortola and that it is there also "probably spontaneous".

Polunin & Huxley (1966) state that this species is found growing on the banks of streams and in damp places by the sea all around the Mediterranean Sea, flowering there from June to September. Its seeds from the days of Dioscorides have been celebrated for their ability to subdue "the inclination natural" between the sexes of man; hence the vernacular name of "chaste tree" for the species and genus. This property renders the plant especially useful for celibates, and this, in turn, has led to the common name of "monk's pepper". However, the fresh seeds have an aromatic pungency, and so have been considered by other "authorities" to have aphrodisiac properties! The species is still employed in some quarters as a medicinal plant in the treatment of eye diseases and stomach aches.

Maheshwari (1963) describes the plant as it is grown in Delhi, India, as follows: "Flower clusters dense, in a spike-like inflorescence; leaflets lanceolate.....A strongly aromatic shrub, woolly-tomentose throughout. Leaves digitate, long-petiolate, velvety. Leaflets 5--7, lanceolate, 4--10 x 0.65--1.3 cm., entire. Flowers pale purple or violet, in interrupted spikes in groups of several. Stamens exserted. Drupes small, globose, exceeding the calyx, 4-celled. Grown in shrubberies of parks and gardens. Flowers: June--Sept." He cites Maheshwari 220. The plant is described by Bose as having blue flowers, with the comment that blue and violet flowers are not common on perennial plants [in India] -- possible var. caerulea Rehd. is involved here.

Encke (1960) describes the plant thus: "Mönchspfeffer. Mittelmeergebiet, Westasien. September, Oktober. Bis 3 m hoher, ausgebreitet wachsender Strauch, mit graufilzigen Trieben. Blätter ge-

finger, 5- bis 7zählig. Blättchen 5--15 cm lang, 0,6--1,8 cm breit, meist ganzrandig, unterseits graufilzig. Blüten in 7--17 cm langen, rispigen Endähren, hellviolett, duftent. -- Wahrscheinlich schon lange vor dem 16. Jahrhundert in Kultur. E. I. IV/3a: 171; W. III: 165." Cave (1964) reports the diploid chromosome number as 32.

King (1932) describes the seedlings of V. agnus-castus as follows: "Seedling....2 inches tall, seed leaves and 3 pairs of succeeding leaves. Roots fibrous branching; secondary roots present. Hypocotyl pale. Cotyledons narrow, oval, rounded at apex, short petiolate. Leaves opposite. First pair obovate, crenate, petiolate, exstipulate, entire, pinnate net-veined. Second pair, obovate, obtuse, entire; petiole half the length of the leaf blade. Third pair similar to the first and second, with indications of division, and some serration on margin of leaf. Plant agreeably aromatic." Mattfeld found it growing at 650 m. altitude.

Jiménez (1967) reports that in the Dominican Republic this species is called "yerba Luisa" and "yerba de la suerte". Twisselmann (1967) records it from Kern County, California, and says "single robust spontaneous shrub grows in dry canal bottom in alkali sink in the Weedpatch region (T 7409), full bloom in July; volunteers can be expected freely when and if planted in Kern County gardens." Betts (1944) tells us that the species was growing in Thomas Jefferson's nursery on April 11, 1807.

The E. K. Balls 565, Kocher B.12, Regel s.n. [VII-VIII 1882], s.n. [1882], & s.n. [VII.1883], and Rodi 5272, distributed as V. agnus-castus, are all var. pseudo-negundo Hausskn., while the Herb. Post s.n. [Hamath, Aug. 1884] is probably V. negundo L. and Stefani s.n. [10 Mai 1903] is not verbenaceous.

Additional citations: SOUTH CAROLINA: Greenville Co.: Rodgers & Mullens 67086 (Mi). GREECE: Ballalas s.n. [Mount Athos, 1921] (W--1093257); Mattfeld 2035 (W--1430411), 2644 (W--1430469). ITALY: C. Bicknell s.n. [11 Julio 1892] (W--73899); Herb. Ball s. n. [Liguria, Jul. 1851] (W--682454); Vazreda s.n. [Gerona, 20 Aout 1876] (W--147604). CORSICA: Aellen 1856 (W--1627894). JUGOSLAVIA: Herzegovinia: Raap 240 (W--549184). UNION OF SOCIALIST SOVIET REPUBLICS: Turkenskaya: Regel s.n. [VII.1884] (W--597961). Province undetermined: Collector undetermined s.n. [2/VI/1912] (W--2090768). TURKEY: Fidaio s.n. [Environs de Smyrne, Aoft 1904] (N). ISRAEL: Field & Lazar 233 (N). SYRIA: Herb. Post s.n. [Beirut River, June 3/71] (N), s.n. [Anitab, Aug. 9, 1882] (W--805059); Herb. Torrey s.n. [Beirut, July 1884] (T). IRAQ: Field & Lazar 735 (N), 818 (N), 953 (N); Lazar 337 (N). IRAN: Bunge 1 (W--1094135). CULTIVATED: Brazil: M. L. Vasconcelos 14 (W--2503779). District of Columbia: Vasey s.n. [Ag. grounds, 1876] (W--73897), s.n. [Cultivated, 1884] (W--73898). New York: H. N. Moldenke 24325 (Ac). Locality undetermined: A. Wood s.n. [Gardens, South] (Ms--30947).

VITEX AGNUS-CASTUS f. ALBA (West.) Rehd.

Additional bibliography: Moldenke, *Phytologia* 15: 225. 1967; Moldenke, *Résumé Suppl.* 15: 16 & 24. 1967.

VITEX AGNUS-CASTUS var. CAERULEA Rehd.

Additional bibliography: Moldenke, *Phytologia* 15: 225. 1967; Moldenke, *Résumé Suppl.* 15: 24. 1967.

VITEX AGNUS-CASTUS var. DIVERSIFOLIA (Carr.) Schelle

Additional bibliography: Moldenke, *Phytologia* 15: 225. 1967; Moldenke, *Résumé Suppl.* 15: 15, 16, 24, & 25. 1967.

VITEX AGNUS-CASTUS f. LATIFOLIA (Mill.) Rehd.

Additional bibliography: Steud., *Nom. Bot.*, ed. 1, 888. 1821; Moldenke, *Phytologia* 15: 225--226. 1967; Moldenke, *Résumé Suppl.* 15: 2, 16, & 24. 1967.

VITEX AGNUS-CASTUS var. PSEUDO-NEGUNDO Hausskn.

Emended synonymy: *Vitex negundo* var. *pseudo-negundo* Hausskn. apud Moldenke, *Phytologia* 15: 226, in syn. sphalm. 1967.

Additional & emended bibliography: Galil, Eizikowitch, & Prusbul, *Hort. Bot. Univ. Tel-aviv. Ind. Sem.* 1965: 5. 1965; Galil, Eizikowitch, Prusbul, & Tankus, *Hort. Bot. Univ. Tel-aviv. Ind. Sem.* 1966: 5. 1966; Guest, *Fl. Iraq* 1: 84. 1966; Moldenke, *Phytologia* 15: 226. 1967; Moldenke, *Résumé Suppl.* 15: 24 & 25. 1967.

Guest (1966) tells us that one finds this plant growing "among arborescent species in mountain riverain forests" in Iraq. Rechinger found it along rivulets in Iran, flowering in February. Kocher describes it as a "Flowering shrub with terminal spike of many blue flowerets, each about 1/4 inch across, Iris or pea-shaped. The largest lower lip of the floweret dark purple with yellow beard, 4 upper side lobes lavender. Stamens free at center with purple tips. Leaves palmate, olive green. Plant has a delicate graceful appearance, growing to a height of 4 ft." He found it growing 930 feet below sealevel. Balls found it as about sealevel and says "Fls. in shades of pale lilac or lavender-blue, each bush a separate colour. Spike 6--12" long. Lax shrubs to 15 ft. tall and spreading by underground runners. In sandy soil by sea shore, dark volcanic sand."

Material has been misidentified and distributed in herbaria as *V. agnus-castus* L.

Additional citations: UNION OF SOCIALIST SOVIET REPUBLICS: *Turkmanskaya: Regel s.n.* [VII-VIII 1882] (W--597962), *s.n.* [1882] (W--272465), *s.n.* [VII.1883] (W--272466). TURKEY: *E. K. Balls* 565 (W--2318762). ISRAEL: *Amdursky* 280 (W--1628615). SYRIA: *Kocher B.12* (W--2336802). IRAQ: *Rodi* 5272 (W--2272683). IRAN: *Aellen & Esfandiari* 3996 (W--2127950); *K. H. Rechinger* 1308 (W--2061215); *Rechinger & Rechinger* 5778 (W--2128126).

VITEX AGNUS-CASTUS f. VARIEGATA Moldenke

Additional bibliography: Moldenke, Phytologia 15: 87. 1967;
Moldenke, Résumé Suppl. 15: 24. 1967.

VITEX AJUGAEFLORA Dop

Additional bibliography: Moldenke, Phytologia 15: 226. 1967.
Additional citations: INDOCHINA: Cochinchina: Pierre s.n. [10/
1866] (W--1757901).

VITEX ALTISSIMA L.f.

Additional & emended synonymy: Vitex pubescens Heyne ex Wall., Numer. List [48], no. 1755, in syn. 1829 [not V. pubescens Vahl, 1794]. Vitex altissima L. ex Roxb., Fl. Ind., ed. 2 [Carey], 3: 71. 1832. Vitex trifolia Moon apud Trimen, Handb. Fl. Ceylon 3: 357. 1895 [not V. trifolia Graham, 1966, nor Hemsl., 1949, nor L., 1753, nor L.f., 1895, nor Sessé & Moc., 1940, nor Vahl, 1941, nor "sensu Matsumura & Hayata", 1963].

Additional & emended bibliography: J. F. Gmel. in L., Syst. Nat., ed. 13, pr. 1, 2: 962 (1789) and pr. 2, 2: 962. 1796; Pers., Sp. Pl. 3: 360. 1819; Steud., Nom. Bot., ed. 1, 888. 1821; Wall., Numer. List [48], no. 1755. 1829; Roxb., Fl. Ind., ed. 2 [Carey], 3: 71--72. 1832; Gamble, Man. Ind. Timb., ed. 1, 297 & 298. 1881; Watt, Econ. Prod. India 7: 255. 1883; Watt, Dict. Econ. Prod. India 6 (4): 247. 1893; Gamble, Man. Ind. Timb., ed. 2, 539 & 540. 1902; Gamble, Fl. Presid. Madras 2: 1101--1103. 1924; H. F. Mac Millan, Trop. Plant. & Gard., ed. 5, pr. 3, 197, 198, 214, 217, & 529. 1962; R. K. Gupta, Journ. Indian Bot. Soc. 41: 10. 1962; Arora, Journ. Indian Bot. Soc. 42: 41, 42, & 50. 1963; Rao & Sastri, Bull. Bot. Surv. India 6: 160 & 164. 1964; Maheshwari & Singh, Dict. Econ. Pl. India 166. 1965; S. V. Ramaswami, Study Flow. Pl. Bangalore [thesis] xxix, 1028--1029, & 1467. 1966; Sebastine & Ramamurthy, Bull. Bot. Surv. India 8: 180. 1966; Naitani, Bull. Bot. Surv. India 8: 260. 1966; J. L. Ellis, Bull. Bot. Surv. India 8: 329 & 337. 1966; Moldenke, Phytologia 15: 226--227, 267, 307, 316, & 324. 1967; Moldenke, Résumé Suppl. 15: 10, 15, 24, & 25. 1967.

It should be noted here that the V. trifolia of Linnaeus is a valid species, that accredited to Graham is a synonym of V. nungundo L., that accredited to Hemsley and to "sensu Matsumura & Hayata" is V. trifolia var. simplicifolia Cham., that ascribed to Sessé & Mociffo is V. mollis H.B.K., that ascribed to Vahl is V. triflora Vahl, and that ascribed to Linnaeus the younger is V. trifolia L. The date for Heyne's synonym is given erroneously as "1824" by Santapau & Wagh (1963).

MacMillan (1962) states that V. altissima is best grown on calcareous soil and is reasonably immune to termite attack. In India its wood is used for building purposes and cabinet work. He records the vernacular names "kadamanakku", "kaddamanakka", "milla", and "sapu-milla". Gupta (1962) states that the species grows up to 4000 feet altitude in the eastern Himalayas and Ghats. Ellis

(1966) records the species from Andhra Pradesh and tells us that it prefers a rocky substratum, flowering in July, and cites a National Herbarium number 14252. Naithani (1966) refers to it as "common", flowering and fruiting in August, and cites a number 21114. Rao & Sastry (1964) report it as "common" in Madras, but Sebastine & Ramamurthy (1966) found only a "few" in that state, citing a number 14693.

Additional citations: INDIA: Bombay: Stocks, Law, & al. s.n. [Malabar, Concan &c.] (W--2497091, W--2497123).

VITEX ALTISSIMA f. SUBGLABRA Thwaites

Additional bibliography: Watt, Dict. Econ. Prod. India 6 (4): 247. 1893; Moldenke, Phytologia 15: 226--227. 1967; Moldenke, Résumé Suppl. 15: 10, 15, 24, & 25. 1967.

VITEX AMBONIENSIS Gürke

Additional bibliography: Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1055 & 1454. 1962; Moldenke, Phytologia 15: 227. 1967; Moldenke, Résumé Suppl. 15: 8. 1967.

The Balsinhas 242, F. A. Mendonca 2705, and Torre 2067, 2277, & 3829, distributed as V. amboniensis, are all V. tangensis Gürke. The last-mentioned of these collections is actually described by Garcia as "intermediate" between the two species.

VITEX BARBATA Planch.

Additional bibliography: Moldenke, Phytologia 15: 228 & 258. 1967; Moldenke, Résumé Suppl. 15: 24. 1967.

VITEX BERAIVIENSIS Vatke

Additional bibliography: Moldenke, Phytologia 15: 228. 1967; Moldenke, Résumé Suppl. 15: 24. 1967.

VITEX BERAIVIENSIS f. PILOSA Moldenke

Additional bibliography: Moldenke, Phytologia 15: 91. 1967; Moldenke, Résumé Suppl. 15: 24. 1967.

VITEX BERAIVIENSIS f. VILLOSA Moldenke

Additional bibliography: Moldenke, Phytologia 15: 91. 1967; Moldenke, Résumé Suppl. 15: 24. 1967.

VITEX BETSILIENSIS Humbert

Additional bibliography: Moldenke, Phytologia 15: 228. 1967.

Additional citations: MADAGASCAR: Decary s.n. [18-2-1938] (W--2494780).

VITEX BOJERI Schau.

Additional bibliography: Moldenke, Phytologia 15: 229 & 242. 1967; Moldenke, Résumé Suppl. 15: 24. 1967.

VITEX CANESCENS Kurz

Additional bibliography: Gamble, Man. Ind. Timb., ed. 1, 296

(1881) and ed. 2, 541. 1902; Moldenke, *Phytologia* 15: 230. 1967.

The species has been found growing in thickets on Hainan Island. The corollas are described as having been "whitish-yellow" on F. C. How 70722.

Additional citations: INDIA: Assam: Chand 3151 (Mi). Khasi States: C. B. Clarke 38117c (W--803395). CHINA: Hupeh: E. H. Wilson 408 [6/07] (W--777035), 408 [10/07] (W--777035). Kwangtung: Peng, Tak, & Kin s.n. [Herb. Canton Chr. Coll. 12882] (W--1248092). Kweichow: Steward, Chiao, & Cheo 936 (W--1659309); Tsiang 6225 (W--1575155). CHINESE COASTAL ISLANDS: Hainan: F. C. How 70722 (W--1675692).

VITEX CAPITATA Vahl

Additional & emended synonymy: Vitex bignonioides H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 200. 1817. Vitex bignonioides Humb. & Bonpl. apud Steud., Nom. Bot., ed. 1, 888. 1821.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 200 (1817) and ed. quart., 2: 246--247. 1818; Pers., Sp. Pl. 3: 361. 1819; Steud., Nom. Bot., ed. 1, 888. 1821; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; A. Chev., Cat. Pl. Jard. Bot. Saigon 36. 1919; E. J. Salisb., Ind. Kew. Suppl. 11: 265. 1953; Veillon, Revist. Forest. Venez. 5: 59, 61, & 66. 1962; J. A. Steyerma., Act. Bot. Venez. 1: 254. 1966; Moldenke, *Phytologia* 15: 230. 1967.

Prance, Forero, Pena, & Ramos 4623 is said to have had green calyx and blue corollas -- the collectors describe the plant as a treelet, 6 m. tall, called "taruma", growing in islands of forest on savannas.

It should be noted that the H.B.K. reference dates given in the bibliography above have been authenticated by consultation of the work by Barnhart (1902).

Chevalier (1919) reports this species as cultivated in South Vietnam under the vernacular name "binh linh xanh", blooming from June to August, but I have as yet seen no material of it from there. Veillon calls attention to the fact that the leaves of this species are deciduous.

Additional citations: BRAZIL: Roraima: Prance, Forero, Pena, & Ramos 4623 (N, Rf).

VITEX CESTROIDES J. G. Baker

Additional bibliography: Moldenke, *Phytologia* 15: 230. 1967; Moldenke, *Résumé Suppl.* 15: 25. 1967.

VITEX CHRYSOCARPA Planch.

Additional bibliography: A. Chev., *Sudania* 1: 43. 1911; Moldenke, *Phytologia* 15: 231. 1967.

Chevalier (1911) cites his no. 2755 from Senegal in addition to the numbers previously reported.

VITEX CHRYSOMALLUM Steud.

Additional bibliography: Moldenke, *Phytologia* 15: 231. 1967.
Additional citations: MADAGASCAR: Decary 6510 (W--2494779).

VITEX COFASSUS Reinw.

Additional bibliography: Moldenke, *Phytologia* 15: 231--232. 1967; Moldenke, *Résumé Suppl.* 15: 25. 1967.

VITEX COMPRESSA Turcz.

Additional bibliography: Moldenke, *Phytologia* 15: 232 & 313. 1967; Moldenke, *Résumé Suppl.* 15: 4. 1967.

Bernardi found the tree growing at only 100 m. altitude. Steyermark describes it as a tree, 15 m. tall, the leaves subcoriaceous, the veins sulcate above, paler green beneath and there with rugose veins, the fruit green and globose.

Additional citations: VENEZUELA: Bolívar: Bernardi 7400 (N); J. A. Steyermark 86621 (W--2486290), 86722 (W--2486314). Yaracuy: Bernardi 6955 (N).

VITEX CONGOLENSIS DeWild. & Th. Dur.

Additional bibliography: Moldenke, *Phytologia* 15: 232 & 322. 1967.

VITEX COOPERI Standl.

Additional bibliography: Moldenke, *Phytologia* 15: 232. 1967.
Duke reports the fruit of this species green in July.

Additional citations: PANAMA: Darién: J. A. Duke 13572 (Oh).

VITEX CORDATA Aubrév.

This taxon is now regarded as being conspecific with V. simplicifolia Oliv. and the binomial is to be relegated to synonymy there.

VITEX COURSI Moldenke

Additional bibliography: Moldenke, *Phytologia* 15: 240. 1967; Moldenke, *Biol. Abstr.* 48: 10560. 1967.

VITEX CYMOSA Bert.

Additional bibliography: Moldenke, *Phytologia* 15: 240. 1967.

Duke & Bristan found this plant in fruit in April and record the vernacular name, "cuajado", for it in Panama.

Additional citations: PANAMA: Darién: Duke & Bristan 8244 (Oh).

VITEX DIVARICATA Sw.

Additional & emended bibliography: J. F. Gmel. in L., *Syst. Nat.*, ed. 13, pr. 1, 2: 962 (1789) and pr. 2, 2: 962. 1796; Pers., *Sp. Pl.* 3: 360. 1819; Steud., *Nom. Bot.*, ed. 1, 888. 1821; D. R. Harris, *Univ. Calif. Publ. Geogr.* 18: [Pl. Anim. & Man Outer Leeward Isls.] 151. 1965; Steyermark & Agostini, *Act. Bot. Venez.* 1 (2): 13, 14, & 17. 1966; Moldenke, *Phytologia* 15: 241 & 317. 1967; D'Arcy, *Rhodora* 69: 439. 1967.

Additional citations: LEEWARD ISLANDS: Dominica: W. H. Hodge

3847 (Ms--34359).

VITEX DIVERSIFOLIA Kurz

Additional bibliography: Gamble, Man. Ind. Timb., ed. 2, 539. 1902; Moldenke, Phytologia 15: 241. 1967.

VITEX DONIANA Sweet

Additional bibliography: A. Chev., Sudania 1: 4 & 43. 1911; Watt & Breyer-Brandwijk, Med. & Poison. Pl. S. Afr., ed. 2, 1055 & 1454. 1962; Hepper, Bull. Inst. Fond. Afr. Noire 27: 419, 421, & 496. 1965; Camera & Ciferri, Quaderno 39: 455 & 456. 1967; N. H. A. Cole, Bull. Inst. Fond. Afr. Noire 29: 910. 1967; Moldenke, Phytologia 15: 241, 245, 246, 258, 260, & 264. 1967; Anon., Quart. Journ. Crude Drug Res. 7: 1066. 1967.

In Northern Nigeria the crushed leaves of this species, known as "black plum" there, or of the "Guinea peach" (Nauclea latifolia) with sugar or the juice of sugarcane, are added to crushed Randia seed to make a black cosmetic. called "katambiri". The mixture is squeezed through cloth and sold as an inky extract. It makes blue-black patterns on the skin lasting 3 or 4 days. The corolla on Lewalle 2200 is described as having been "blanc à mauve pâle".

Cole (1967) tells us that this is a tree of the forest-savanna mosaics in Sierra Leone, while Hepper (1965) reports it as a typical small tree of the plains in sacred groves, frequent in savannas and on top of the escarpment in Northern Nigeria, but "widespread in the savannas of trop. Africa".

Additional citations: BURUNDI: Lewalle 2200 (Ac, Rf, Z), 2362 (Ac, Rf). PORTUGUESE EAST AFRICA: Manica e Sofala: Garcia 60 (Rf). Mozambique: Barbosa 1763 (Rf). Niassa: F. A. Mendonça 654 (Z).

VITEX DUCKEI Huber

Additional bibliography: Moldenke, Phytologia 15: 242. 1967.

Prance, Pena, Allen, & Ramos 2706 is said to have had blue corollas and the collectors describe the plant as a tree, 10 m. tall, with a trunk 15 cm. in diameter, growing on white sand in high campina country.

Additional citations: BRAZIL: Amazonas: Prance, Pena, Allen, & Ramos 2706 (N, Rf).

VITEX FERRUGINEA Schum. & Thonn.

Additional bibliography: Moldenke, Phytologia 15: 242, 243, & 318. 1967.

VITEX FLAVENS H.B.K., Nov. Gen. & Sp. Pl., ed. folio. 2: 199--200. 1817.

Additional synonymy: Vitex flavens Humb. & Bonpl. apud Steud., Nom. Bot., ed. 1, 888. 1821.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 199--200 (1817) and ed. quart., 2: 246. 1818; Steud., Nom. Bot., ed. 1, 888. 1821; Barnhart, Bull. Torrey Bot. Club 29:

590. 1902; Moldenke, *Phytologia* 15: 243. 1967.

It should be noted that the H.B.K. reference dates given in the emended bibliography above have been authenticated by consultation of the work by Barnhart (1902).

VITEX FLORIDULA Duchass. & Walp.

Additional bibliography: Moldenke, *Phytologia* 15: 243. 1967.

Duke & Bristan record the vernacular name "cuajado prieto" for this species.

Additional citations: PANAMA: Darién: Duke & Bristan 8258 (Oh).

VITEX GAUMERI Greenm.

Additional bibliography: Moldenke, *Phytologia* 15: 244. 1967; Menninger, *Bull. Fairchild Trop. Gard.* 22 (3): 10. 1967.

The Gossweiler specimen, cited below, was originally identified and distributed as Tabebuia palmeri Rose, but was excluded from that species and genus by an expert on the Bignoniaceae. It was collected, according to its label, from a tree which "originated in Mexico". The specimen consists merely of a very small twig with immature leaves. The pubescence characters of the leaflets, petiolules, and petioles, as well as the characters of the twig itself, agree well with those of V. gaumeri, but the leaflets are all very conspicuously sharp-serrate from above the middle to the apex. I have never observed serrate leaflets before this on Vitex gaumeri. The specimen is, therefore, placed here with a question. If it really represents a Vitex, rather than something bignoniaceous, and it actually came from a plant originating in Mexico, then it can hardly represent anything other than V. gaumeri.

Menninger (1967) lists this species as one of the most beautiful flowering trees in the world, "so smothered with blue flowers that one cannot see the leaves".

Additional citations: MEXICO: Chiapas: F. Miranda 7132 bis (W—2508416), 7973 (W—2508423). CULTIVATED: Angola: Gossweiler 13948 (B).

VITEX GIGANTEA H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: 199. 1817.

Additional synonymy: Vitex gigantea Humb. & Bonpl. apud Steud., *Nom. Bot.*, ed. 1, 888. 1821.

Additional & emended bibliography: H.B.K., *Nov. Gen. & Sp. Pl.*, ed. folio, 2: 199 (1817) and ed. quart., 2: 245—246. 1818; Steud., *Nom. Bot.*, ed. 1, 888. 1821; Barnhart, *Bull. Torrey Bot. Club* 29: 590. 1902; Moldenke, *Phytologia* 15: 244. 1967.

It should be noted that the H.B.K. reference dates given above have been verified by consultation of the work by Barnhart (1902).

VITEX GLABRATA R. Br.

Emended synonymy: Vitex leucoxydon Schau, apud Watt, *Dict. Econ. Prod. India* 6 (4): 247, in syn. 1893 [not V. leucoxydon Blanco, 1895, nor L., 1829, nor L.f., 1781, nor Naves, 1918, nor Roth, 1956, nor Roxb., 1814, nor Schau., 1893, nor Span., 1856, nor Wall., 1847, nor

Willd., 1832].

Additional & emended bibliography: Steud., Nom. Bot., ed. 1, 888. 1821; Roxb., Fl. Ind., ed. 2 [Carey], 3: 74. 1832; Watt, Econ. Prod. India 5: 294 (1883), 6: 191 (1883), and 7: 255. 1883; Watt, Dict. Econ. Prod. India 6 (4): 247 & 248. 1893; Koord., Meded. Lands Plant-tuin. Buitenz. 19: 560 & 645. 1898; Gamble, Man. Ind. Timb., ed. 2, 542. 1902; Prain, Bengal Fl., ed. 1, 2: 832 & 833 (1903) and ed. 2, 2: 621, 622, & 1012. 1963; Rao & Rabha, Bull. Bot. Surv. India 8: 301. 1966; J. S. Beard, Journ. Ecol. 55: 277. 1967; Moldenke, Phytologia 15: 244--245 & 253. 1967; Moldenke, Biol. Abstr. 49: 1325. 1968.

Prain (1963) records the vernacular name "ashval" for this plant. Watt (1893) includes V. bombacifolia Wall. and V. pallida Wall. in the synonymy here. Prain (1963) cites the first of the Watt references given in the bibliography above as "E. D. 5: 160", but this is a paragraph reference, not a page reference! Beard (1967) tells us that V. glabrata is one of the members of the broadleaf tree level in Australia with Eucalyptus and Terminalia, but he refers here to V. lucens T. Kirk

Material has been misidentified and distributed in herbaria under the names V. leucoxydon L. and V. leucoxydon Roxb.

Panigrahi, Chowdhury, Raju, & Deka (1964) record V. glabrata from Orissa, where they say it is occasional and flowers in June.

The J. L. Lister 397, distributed as V. glabrata, is probably var. bombacifolia (Wall.) Moldenke.

It should be mentioned here that V. leucoxydon L. f. is a valid species, with the V. leucoxydon accredited to Linnaeus the elder and to Wallich as synonyms, that accredited to Roth and to Roxburgh is V. glabrata var. bombacifolia (Wall.) Moldenke, that accredited to Blanco is V. negundo L., and that accredited to Spanoghe is V. parviflora A. L. Juss.

Additional citations: PAKISTAN: East Bengal: C. B. Clarke 20089f (W--802739), 20089z (W--802740). INDIA: West Bengal: Helfer 17 (W--1668961). BURMA: Prazer 209 (W--369588). THAILAND: Mrs. D. J. Collins 1247 (W--1401055).

VITEX GLABRATA var. BOMBACIFOLIA (Wall.) Moldenke

Emended synonymy: Vitex leucoxydon Roxb., Hort. Beng. 46, hyponym. 1814 [not V. leucoxydon Blanco, 1895, nor L., 1829, nor L. f., 1781, nor Naves, 1918, nor Schau., 1893, nor Span., 1856, nor Wall., 1847, nor Willd., 1832].

Additional bibliography: Moldenke, Phytologia 15: 245. 1967.

Watt (1893) reduces V. bombacifolia Wall. and V. pallida Wall. to synonymy under typical V. glabrata R. Br. The V. leucoxydon accredited to Blanco and to Naves is a synonym of V. negundo L., that accredited to Linnaeus the elder, to Wallich, and to Willdenow is V. leucoxydon L. f., that ascribed to Schauer is V. glabrata R. Br., and that ascribed to Spanoghe is V. parviflora A. L. Juss.

Lister describes this plant as a "large timber tree".

Additional citations: PAKISTAN: East Bengal: J. L. Lister 397 (W—2497335).

VITEX GRANDIFOLIA Gürke

Additional bibliography: Cave, Ind. Pl. Chromosome Numb. 1: 54. 1958; Moldenke, Phytologia 15: 245—246 & 257. 1967.

Cave (1958) reports the diploid chromosome number for this species as 32.

VITEX GUERKEANA Hiern.

Additional bibliography: Moldenke, Phytologia 15: 247 & 318. 1967.

VITEX HARVEYANA H. H. W. Pearson

Additional bibliography: R. H. Compton, Journ. S. Afr. Bot. Suppl. 6: 66 & 156. 1966; Moldenke, Phytologia 15: 247 & 321. 1967.

Compton (1966) describes this species as "a handsome plant", growing in riverside bushveld and along streams in Swaziland. The Codd 5514 previously cited as deposited in my personal herbarium is now in that of the Texas Research Foundation at Renner, Texas.

Additional citations: PORTUGUESE EAST AFRICA: Manica e Sofala: Barbosa 750 (Z).

VITEX HEMSLEYI Briq.

Additional bibliography: Moldenke, Phytologia 15: 248. 1967.

Additional citations: MEXICO: Michoacán: J. Espinosa 835 (Mi).

VITEX HEPTAPHYLLA A. L. Juss.

Additional bibliography: Pers., Sp. Pl. 3: 360. 1819; Steud., Nom. Bot., ed. 1, 888. 1821; Moldenke, Phytologia 15: 248. 1967.

VITEX KENIENSIS Turrill

Additional bibliography: Ivory, East Afr. Agr. Forest Journ. 32: 393—397. 1967; Moldenke, Phytologia 15: 251. 1967; Anon., Biol. Abstr. 49 (7): S.181. 1968; Ivory, Biol. Abstr. 49: 3307. 1968.

Ivory (1967) describes lesions which are produced on the leaves of this plant by the fungi Phoma viticis and Phyllosticta ragatensis. Seedling deaths caused by the former of these may be controlled partially by fungicides. Chronic leaf-spotting due to the latter is reduced under warm dry growth conditions. The transfer of Vitex seedlings, for instance, from Ragati to Little Sagave avoids disease hazards and improves the rate of growth.

VITEX KUYLENII Standl.

Additional bibliography: Moldenke, Phytologia 15: 251. 1967.

Recent collectors describe this plant as a tree, 8—12 m. tall, growing on "cohune" ridges, and with green fruits in May. The corollas were "violet-blue" on Jones, Proctor, & Facey 3031.

BOOK REVIEWS

Alma L. Moldenke

"EXCURSION FLORA OF THE BRITISH ISLES" by A. R. Clapham, T. G. Tutin and E. F. Warburg, second edition, xxxv & 586 pp., Cambridge University Press, London & New York 10022. 1968. \$5.50.

Appearing just under a decade after the first fine edition is this excellent new one following all pertinent innovations from "Flora Europaea" for the ferns with concomitant key changes but intentionally not doing so for the flowering plants because many readers would be handicapped by the changed nomenclature when checking with the "Flora of the British Isles" for further information and illustrations. Probably these and subsequent changes will be recorded in revisions of this latter flora and then will appear in the next edition of the "Excursion Flora". This second edition does add new listings and changes in range of plants.

The keys are still written with simplicity, accuracy and clarity. The family, genus and species descriptions are basically accurate and succinct. The glossary should solve any vocabulary problems of student or amateur naturalist.

An amazing amount of information is included in this (large) pocket-sized book. It is priced very reasonably. It must prove very popular and useful.

"THE BIOLOGY OF AQUATIC VASCULAR PLANTS" by C. D. Sculthorpe, xviii & 610 pp., illus., St. Martin's Press, New York 10010. 1967. \$23.00.

The author presents an up-to-date monographic treatment of morphological, physiological, and ecological aspects of freshwater and marine vascular plants -- the only such in English since Agnes Arber's "Water Plants: A Study of Aquatic Angiosperms" of 1920. This book covers the salient features of the aquatic environment, changes in emergent foliage, submerged and free-floating organs, vegetative polymorphism emphasizing heterophylly, sexual and vegetative reproductive adaptations, phytogeography, growth of plant communities, aquatic weeds and their control, and their esthetic and economic value -- all very effectively and interestingly.

The author has garnered from widely divergent sources much subject matter and an excellent bibliography.

The book is well illustrated. It should be helpful to the undergraduate and graduate student and to biology teachers.

Mention of mangroves was anticipated but missed.

"PLANT VARIATION AND CLASSIFICATION" by C. Ritchie Bell, vi & 136 pp., illus., Fundamentals of Botany Series, Wadsworth Publishing Company, Belmont, California. 1967. \$2.95.

This new member of this very helpful series, like its predecessors, confirms through its presentation the authors' and editors' belief "that an understanding of plants - their parts, their activities, and their relationship to man - is of fundamental importance in appreciating the significance of life. At all levels of organization, in each volume, information gathered by morphologists, physiologists, cytologists, taxonomists, geneticists, and ecologists is combined." In this one the subject of identification and classification is examined in relation to patterns of natural variety directly, interestingly, and with clarity.

It provides what many present-day college teachers of beginning courses often by-pass or jumble because of personal disinterest, lack of background, etc. even though they may be effective instructors of other phases of the life sciences -- a comprehensible explanation of the rules of nomenclature, the nature and use of keys, and a survey of some prominent north temperate plant families. It gives alive and realistic portraits of the distinctions between identification and classification, between phenotypic and genetic variations, between modern and classical taxonomic techniques, and among the various kinds and amounts of variations with their subsequent effects upon different breeding systems.

On page 15 "masculine" and the Latin "parvifolius" are misspelled. On page 34 figures "c" and "d" show such extremes of perigyny that a beginning student would need an intermediate one.

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